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U.S. Army Research Institute
for the Behavioral and Social Sciences

Research Report 1566

A Design Architecture for an Integrated Training System Decision Support System

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and Allen H. Stults
Eagle Technology, Inc.

Susan M. Evans
Vector Research, Inc.

Marcia R. Gibson and William T. Zaldo
EER Systems, Inc.

July 1990

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U.S. ARMY RESEARCH INSTITUTE

FOR THE BEHAVIORAL AND SOCIAL SCIENCES

A Field Operating Agency Under the Jurisdiction of the Deputy Chief of Staff for Personnel

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Research accomplished under contract for the Department of the Army

Eagle Technology, Inc.

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This report presents the results of a systems engineering analysis of the training development process required to produce an Integrated Training System (ITS) for a New Weapons System (NWS). This work was performed in response to the findings of the 1985 Army Science Board and the latest Army Aviation Mission Area Analysis, which suggest that Army training development for NWS can be improved by using a "top-down" approach to training system development starting very early in the NWS acquisition process. The report contains the design architecture for an Army ITS Decision Support System (DSS), portrayed in Information Definition, Mod 0 (IDEFo) diagrams, plus supporting data on potential users of the system, embedded training, ITS data sources, and a set of training system design elements. The architecture spans the full cycle of NWS development from Milestone 0 through fielding and long-term maintenance. It integrates all aspects of ITS development within and across Military Occupational Specialties, such as individual, collective, and combined arms training and institutional, unit, and distributed training. The architecture provides the (Continued)

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FOREWORD

In 1985, the Army Science Board reported the Army's need for a "top-down" approach for the development of training systems to support new weapons systems. In response to this need, the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) is conducting research to develop and evaluate training design rules and guidelines applicable early in the weapons system design process that will facilitate the development of an integrated set of requirements for training devices, simulators, and simulations, including embedded training, for both weapons systems and units.

This report provides the results of a key step in that process: a systems engineering analysis of the training development process required to produce an integrated training system design for an evolving new weapons system. It includes a diagrammatically displayed integrated training system design architecture plus supporting information on potential system users, embedded training, data sources, and training system design elements.

The work described is a portion of research task 3105, Techniques for Early Estimation of Training Systems Requirements, conducted for the Army Project Manager, Training Devices (PM TRADE) by the ARI PM TRADE Field Unit under a Memorandum of Understanding, "Expanded MOU Between PM TRADE and ARI," dated 14 July 1986.

Final results were briefed to the Chief, PM TRADE Research and Engineering Division, on 1 March 1990.

The model described in this report provides the basis for the functional specifications for a decision support system to facilitate the training system design process. The specific intervention points identified provide the focus for continuing efforts to develop individual methods and procedures that are compatible with the overall model.

EDGAR M. JOHNSON
Technical Director

A DESIGN ARCHITECTURE FOR AN INTEGRATED TRAINING SYSTEM DECISION SUPPORT SYSTEM

EXECUTIVE SUMMARY

Requirement:

To develop the requirements for a model to address the findings of the 1985 Army Science Board and the 1982 Army Aviation Mission Area Analysis, which suggest that Army training for new weapons systems (NWS) can be improved by: (1) using a "top-down approach to training development, (2) starting very early in the weapons system development process, and (3) creating an audit trail of training decisions and outcomes.

Procedure:

An analysis of regulations and procedures for training development in Army aviation training was conducted. In addition, interviews were conducted with personnel involved in Army training system design. Information gained during this data collection was used in the analysis process. A systems engineering effort was then conducted, using the Information Definition, Mod O (IDEFo) methodology, to describe the training development process required to produce an integrated training system (ITS) design for an evolving NWS.

Findings:

Four types of potential users were identified: Training Developers within the Army Training and Doctrine Command (TRADOC); System Engineers within the Army Project Manager for Training Devices (PM TRADE); Training Officers at the gaining commands; and Training Managers in the NWS Program Manager's Office.

The approach resulted in 199 IDEFo diagrams, each accompanied by a brief narrative description. Since the process is to support ITS development and refinement over the life cycle of the NWS, the ITS design must go through several evolutions. The initial ITS design, called the Notional ITS design, is developed during the Concept Exploration Phase when little is known about the final NWS design. Consequently, it is based mostly on historical, generic, or projected training requirements. In the Demonstration and Validation Phase, when more is known about the NWS, the Notional

ITS design is replaced by the Baseline ITS design. This design is based on the considerable NWS data resulting from the Demonstration and Validation Phase. The purpose of the design at this stage is to prepare for procurement activities in Full Scale Development (FSD). In FSD, a contractor creates an Actual ITS to support FSD activities such as training test crews and initial cadres or instructors. During the Production Phase, the Actual ITS is expanded to meet the needs of fielding the NWS. The Actual ITS is maintained and revised in response to changes in areas such as NWS design and tactics during the extended operational life of the weapons system. As future changes are planned, and steps are taken to replace existing training system design elements, a Future ITS design is created to track these developments before they are implemented.

Utilization of Findings:

The model described in this report, Training System Estimation and Refinement (TRASER), provides the basis for the functional specifications for a decision support system to facilitate the integrated training system design process. The specific intervention points identified will provide the focus for continuing efforts to develop individual methods and procedures which are compatible with the overall model.

REQUIREMENTS FOR EARLY TRAINING ESTIMATION AND TRAINING SYSTEM DEVELOPMENT

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A DESIGN ARCHITECTURE FOR AN INTEGRATED TRAINING SYSTEM DECISION SUPPORT SYSTEM

Introduction

The Army Research Institute for the Behavioral and Social Sciences (ARI) is actively designing techniques to support the development of cost-effective training systems. A comprehensive "training system development architecture" is needed to identify the necessary components of a training system and its interfaces with weapons system acquisition. To meet this need ARI initiated the Training System Estimation and Refinement (TRASER) program, so named because the final product was to be a decision support system which "traced" the development of an Integrated Training System (ITS) from conception through implementation and sustainment. The program was sponsored by the ARI PM TRADE Field Unit and performed by Eagle Technology, Inc. with subcontractor support from EER Systems, Inc. and Vector Research, Inc. The purpose of the first portion of the program, described in this report, was to develop a detailed model of the lifecycle of the process of ITS design associated with the development of new weapon systems. This model integrates:

- Individual, collective, and combined arms training.
- Institutional, unit, and distributed training.
- Training across each MOS required to operate, maintain, support, and employ a new weapon system.
- The training system development process with the weapon system development process.
- A variety of training development tools currently under development.
- All elements of a training system (instructional media and methods, consumables, facilities, personnel, publications, and performance measurement systems).
- Training decisions embedded into the training system design process.
- Data from multiple sources to support training system design.

The procedure used to develop the model has the benefits of a top-down system engineering approach in providing total integration of ITS components as they are defined during evolution of the weapon system. It provides a comprehensive real-world model suitable for use in defining points for development of decision aids and job aids to support ITS development.

Overview

The TRASER program focuses on the ITS acquisition process. Specifically, this report is a design study and is concerned with definition of user requirements and a concept for the TRASER system architecture. Primary products of this design study are:

- An integrated top-down architecture of the Army ITS design process.
- Identification of the Army organizations which will benefit the most by using TRASER.
- A list and definitions of design elements required to comprehensively define Army ITS.
- A listing and evaluation of design data sources to support ITS development.
- Preliminary identification of points in the ITS design process at which TRASER will provide the most benefit to Army ITS designers.
- An overall assessment of the feasibility of TRASER to improve the ITS design process.

TRASER will be designed to support ITS development throughout the Army Lifecycle Systems Management Model (LCSMM). It will support multiple organizations as they perform a variety of functions. The major purposes of TRASER will be to:

- Generate and refine an optimal ITS design during the entire course of weapon system evolution.
- Integrate and support training developers' roles within the LCSMM at key points in the ITS development process.
- Provide an evolving capability to retain "corporate memory" of the development of the training system, including program successes, problems, and technologies.
- Facilitate training development by identifying and institutionalizing a process that leads to an improved ITS design.

Requirements for TRASER

The original requirement for a tool like TRASER came from the 1985 Army Science Board. A significant finding of the Army Science Board was that "A training system. . . must consider mission, threat, doctrine, other elements of the battlefield, individual and crew training, simulators, simulations,

courseware, personnel and equipment, resources of the unit, provide training objectives and strategies, analyze training transfer, and finally measure overall training effectiveness and determine readiness" (Peden et al, 1985). These findings point to the need for a top-down integrated process for the development of Army training systems. This integrated process would include all the training system components considered as a unified whole. It would begin at Milestone 0 and continue for the lifecycle of the weapon system.

Other requirements for TRASER-like tools were found in the latest Army Aviation Mission Area Analysis (AAMAA) (Army Aviation Mission Area Analysis, 1982) These requirements were derived from deficiencies in ITS acquisition, operation, and maintenance. The deficiencies are:

- The "current system of training device development is not sufficient to support introduction of new aircraft systems".
- Initiation of training device development occurs too far into the aircraft system procurement cycle to field training devices in conjunction with aircraft Initial Operational Capability (IOC).
- An effective method does not exist to determine the expected cost and training effectiveness of the supporting training devices for continuation training.
- Aircraft training devices are not available to the field for all current and projected aircraft.
- Training systems fail to keep current with the supplied weapon system.

An Aviation Systems Command (AVSCOM) staff study on aviation training also noted some deficiencies in the ITS development process (Aviation Systems Command Staff Study: Training Devices, 1984). In brief, the staff study found a:

- Need for coordination of all training efforts because of a fragmentation of efforts, responsibilities, and accountability, and a lack of corporate memory of successes, problems, and technologies in training devices.
- Need to provide continuous status of current training program developments, funding, and technology.
- Need to establish a basis for performance measures of training, including models of factors influencing the cost and worth of ownership of simulation devices.

- Need to maintain a formal track record of development of various training programs.

- Need to have cross-fertilization of experiences in training R & D.

Scope of The Present Effort

The major thrust of this effort was to conduct a comprehensive analysis of the Army's process of ITS design as part of the acquisition of major new weapon systems. In developing the top down architecture of the Army ITS design process, TRASER analysts sought to integrate the formal documented system and the informal system. The informal system results from individual variations in how Army personnel accomplish the steps of the formal system and adjustments necessitated by specific program requirements. A major goal of the TRASER analysis was to portray an architecture which is consistent with the documented formal system, but which includes relevant activities from the informal system. The result is intended to be a "real world" representation of ITS design as part of major weapon system acquisition.

In order to bound data collection, it was necessary to select a proponency as the primary source of system-specific data. The TRASER team selected aviation as the focus of this data collection. Aviation was selected as the initial proponency beca'.se it:

- Was believed to be representative of other major proponencies in ITS complexity.

- Has aircraft at several stages of the LCSMM process to serve as models.

Within the aviation proponency the TRASER team chose the LHX program as the example of greatest interest. The AAMAA findings have had a big impact on the LHX program. In response to the AAMAA the LHX project office has departed from the traditional approach to development of an ITS for aviation weapon systems. The LHX approach can be characterized by several new procedures:

- Development of the ITS began early in the Concept Exploration phase of the LCSMM when the weapon system itself was being initially defined. Under contract, notional training system elements were defined and costed very early in the LCSMM process. This early definition of the ITS started the evolutionary process that will lead to the final design of the ITS by the weapon system prime contractor.

- The New Equipment Training (NET) Branch at the Army Aviation Center and the NET Branch at the Army Aviation Logistics School were brought into the ITS development process very early to help define training requirements and ITS concepts. This procedure helped ensure that the final product would be satisfactory to the using community.

- A training representative was established in the LHX Program Manager (PM) office at AVSCOM to oversee training development and ensure that an adequate ITS was procured that meets the users' requirements. One of the major roles of the LHX PM/Training is to work closely with the users at the Army Aviation Center and the Army Aviation Logistics School.

These new procedures that the LHX project has adopted are being viewed within the Army training community with interest. While atypical of previous ITS development efforts in the Army, the new approaches are reasonable responses to AAMAA and AVSCOM study findings. If these procedures work (i.e., lead to a better ITS, configured as the weapon system is configured, and delivered by IOC within budget constraints), they may become institutionalized in the LCSMM process.

ITS development procedures used in the LHX program are the most consistent with the goals of TRASER. The LHX program office recognized the need to begin ITS development very early in the LCSMM process (at Milestone 0) and to refine the ITS design as the aircraft evolves.

Although aviation was selected as the sample proponency for data collection and analysis, the intent of the TRASER team was for aviation to be the sample which could be generalized across other proponencies. Two members of the E-Tech Team (both former officers in TRADOC) reviewed TRASER architecture against requirements for other proponencies and concluded that TRASER, with very minor changes, will support other proponencies as well. In particular, armor which, like aviation, requires large complex major systems procurements uses substantially the same system as that presented in the TRASER architecture.

TRASER will support development of new weapon system-specific ITS. It will not, however, support non-system developments (i.e., developments that support more than one weapon system, such as AIRNET). Similarly, the initial version of TRASER will only address training for major weapon systems, not non-major weapon systems. Also, TRASER will be initially designed to support the LCSMM process, not the Accelerated System Acquisition Process (ASAP). These variations can be added after the feasibility of a basic TRASER is established.

Technical Approach

ARI and E-Tech chose a rigorous technical approach which was designed to help ensure that the results of the effort reflect the "real world" of Army weapons systems acquisitions. Through this approach TRASER analysts:

- Assessed the need and specific requirements for a system such as that embodied in the TRASER concept, and determined the candidate users of the system.

- Studied the documented Army ITS acquisition process with emphasis on those portions related to the goals of TRASER.

- Studied the roles and responsibilities of organizations and individuals in the acquisition process as they actually function during the design and fielding of an ITS for a major new weapon system.

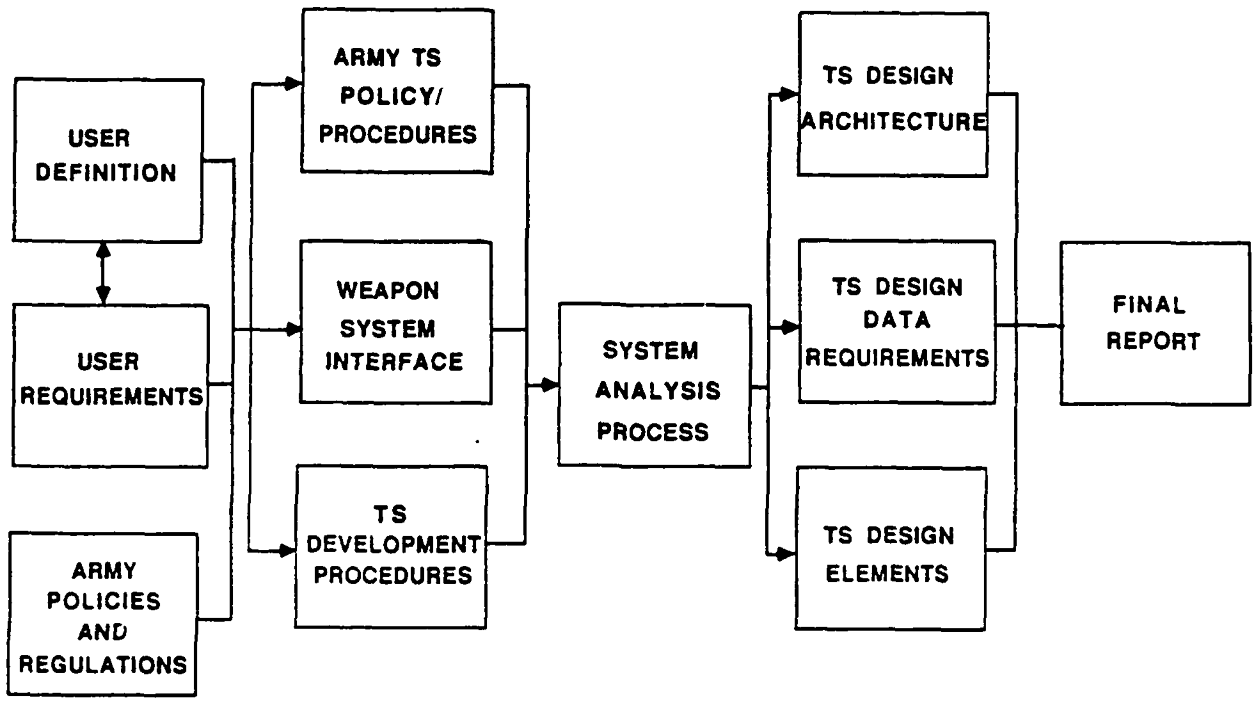
- Developed an accurate and precise profile of the process of designing and fielding a major new ITS.

- Developed ancillary and supporting concepts and information as integral parts of the TRASER concept and design.

In accomplishing the above goals E-Tech used a systematic process of data collection, synthesis, analysis, and definition of results. One of the major reasons for using the selected technical approach was to ensure that the analysis captured the "real world" essence of Army ITS design in terms of personnel, organizations, and processes. Accomplishing this involved extensive reviews of publications and interviews with personnel in selected positions in the Army. The TRASER team used these and other data available to the team to conduct the analysis effort. Figure 1 shows an overview of the process used to perform the program. Steps in the process are discussed briefly in the list below. More details of each step are presented in subsequent paragraphs.

- A major step was to understand the potential users of TRASER and the specific user requirements that TRASER might satisfy. During this process TRASER analysts interviewed a number of personnel in different Army organizations. Appendix A contains a listing of interviews and trips.

- It was essential that TRASER analysts have a clear understanding of the policies and regulations that guide the design of training for major new Army systems. Much of the initial effort was to assemble and study the



TS = Training System

FIGURE 1. Overview of the TRASER analysis process.

relevant publications. Appendix B is a bibliography of the policies, regulations, and other publications which were accessed during the program. Appendix C contains the references cited in this report.

- From the above steps TRASER analysts developed the prerequisite information necessary for the systems engineering analysis. This information was in three primary areas: (1) Army training system policies and procedures, (2) interface of training system design with the evolution of the weapon system, and (3) Army training system development procedures.

- The major analysis step of the program was to use a systems engineering process to display the Army system for designing ITSs for major new weapon systems. Using the systems engineering process TRASER analysts produced an architecture of the Army ITS design process. From and in conjunction with development of the architecture, TRASER analysts identified ITS design data requirements and ITS design elements. Appendix D contains the ITS design architecture which was the product of the systems engineering process. Appendix E contains the training system design element taxonomy followed by definitions of the training system design elements in the taxonomy.

- The final step was to document all activities and results in this report.

The remainder of this section contains more discussions of the steps used in the TRASER analysis process. The following sections are intended to provide the reader with a clear understanding of how E-Tech approached the TRASER challenge, and how information was collected and used to develop the foundational elements of TRASER.

User Definition

Organizations in the LCSMM process were identified that are involved in the acquisition of new weapon systems (materiel) and their ITSs. This process led the analysts to focus on two major Army organizations: the Army Materiel Command (AMC) and the Training and Doctrine Command (TRADOC). Within these organizations, E-Tech focused on the roles of the Program Manager for Training (PMT), Training Developers (who interact with both Materiel Developers and Combat Developers) and PM TRADE System Engineers (who develop training equipment and ET). This focus, established early in the program, enabled the TRASER team to concentrate its data collection efforts on the needs of real users in the Army Training community.

Background Literature Review

As part of the process of identifying potential users for TRASER and identifying actual requirements of those users, E-Tech obtained a large number of documents containing information on the design of training systems in the acquisition process for major weapons systems. These documents provided the information required to develop the conceptual framework for analyzing the process of designing ITSs during the acquisition of major new Army systems and for understanding the details of the process. The thrust of this data collection and analysis was to gain information on broad Army policies and procedures, followed by the more detailed information necessary to understand AMC and TRADOC policies and procedures, and finally application and examples from the aviation proponency with emphasis on the LHX program. Appendix B is a complete bibliography of documents used in the program.

Site Visits and Interviews

A major part of the data collection effort was on-site visits and interviews with selected personnel who actually perform technical jobs in key aspects of ITS design during weapon system acquisition. Using the background knowledge gained from the review of documents, analysts used the visits and interviews to gain first-hand information on how ITSs are designed, and the roles and responsibilities of personnel and organizations involved in the process. The focus of data collection was on AMC and TRADOC. Listings of organizations, personnel, and types of information collected are provided in Appendix A.

Research Approach

E-Tech chose a research approach centered around a top-down integrated analysis of ITS development. The approach was designed to provide an accurate and complete representation of the ITS development process and to provide the information necessary to design the TRASER architecture. The integrated analysis tool was the Information Definition, Mod 0 (IDEFo) systems engineering technique (Marca and McGowan, 1987).

IDEFo Methodology. IDEFo is a formal system for describing the hierarchy of functions that will be performed by the new system. IDEFo, as a discipline, was developed by the Integrated Computer Aided Manufacturing Office of the U.S. Air Force to describe the functions and data of a complex system. In IDEFo terms, a system is any combination of machinery, data, and people working together to perform a useful function. IDEFo thus is a communication device that enables systems engineers to communicate their ideas about the system to others in a standard, rigorous manner. IDEFo is intended to serve this purpose for the TRASER system. It will define the arrangement of functions

(architecture) that make up TRASER. These functions will provide design guidance for those who will subsequently design and develop TRASER.

IDEFo diagrams are composed of boxes which contain functions or activities and lines connecting the boxes which describe data flowing between the activities. Input data enters each activity box from the left and output data exits the box to the right. Arrows at the top of boxes reflect constraints or controls on that activity while arrows at the bottom of each box reflect mechanisms that perform the activity. Input data are transformed by the activity into the output data by the mechanism within the controls placed on that activity. These relationships are shown in Figure 2.

In contrast to flowcharts, IDEFo diagrams isolate and describe functions in terms of a process with explicit inputs and outputs. Flowcharts isolate decision paths, often without respect to the transformation of information. Flowcharts describe the process decision network. IDEFo diagrams describe the requirements, inputs, mechanisms, constraints, and outputs of a process.

In the process of applying IDEFo protocol to training processes and producing sufficient detail in the diagrams to communicate to subsequent System Design Engineers who may not be familiar with TRASER, it became necessary to embellish the diagrams. Additional inputs were included in some blocks to communicate everything necessary to perform that function. In some cases, these additional inputs do not get transformed into the output but remain intact. These additions reflect fundamental differences between training and manufacturing, where IDEFo originated.

The diagrams in an IDEFo description describe the system in a modular, top-down manner. The first IDEFo diagram represents the top-level, most abstract description of the system to be created. This diagram is represented by one box with all inputs, outputs, constraints, and mechanisms identified. This top-level box is decomposed into not more than six second level activities. These second level activities are in turn decomposed, creating successively more descriptive detail about the functions of the system. At some point in the analysis, a level is reached where more decomposition is fruitless. At this point, the architecture of the system is complete, subject to review and revision. It is to this point that the present study took the TRASER definition. In the diagrams in Appendix D these points are identified by an asterisk (*) in the lowest level block of that branch of the analysis.

The functional description contained in the sum of the IDEFo diagrams represents the requirements for TRASER and define its

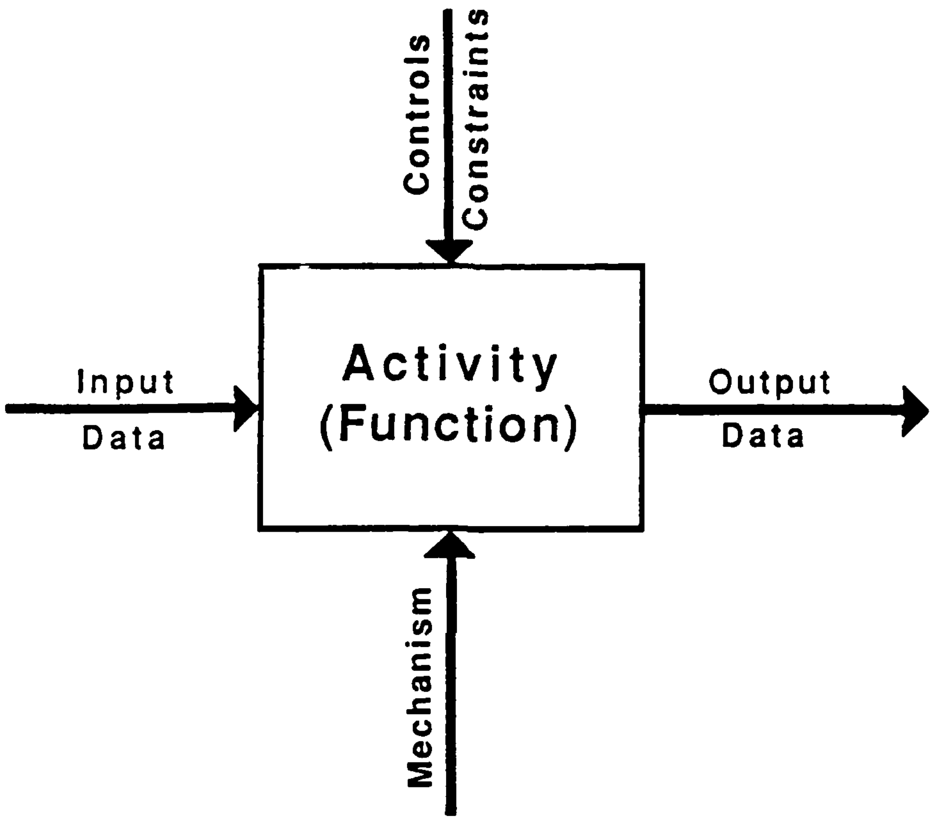


FIGURE 2. Relationships in the IDEFo Process.

architecture. In subsequent projects this architecture will be processed into specifications for interventions in the form of computer-based or manual decision aids and job performance aids. These specifications will be used to procure the actual design and development of TRASER.

Rules for Identifying TRASER Activities. TRASER analysts and systems engineers used the rules discussed below to guide implementation of the IDEFo systems engineering process. The rules were intended to provide the necessary standardized framework to take the data and information collected through the literature reviews and interviews, and display those data and information in IDEFo formats.

- Step 1 - Understand Army Regulations governing ITS development. This process yields allowable procedures ("what is"), permissible variations to procedures ("what can be"), and absence of restrictions ("also what can be").

- Step 2 - Identify where changes are needed in the ITS development process, using Army Aviation Mission Area Analysis and Battlefield Development Plan (AAMAA/BDP) results and other documents that describe deficiencies in the process.

- Step 3 - Identify usable ARI products and other products that address deficiencies that can be incorporated into TRASER, such as the Optimization of Simulation-Based Training Systems (OSBATS), the Automated Systems Approach to Training (ASAT), HARDMAN, MANPRINT tools, and Blueprint of the Battlefield, and make maximum feasible use of them.

- Step 4 - Combine "what is" in terms of available ITS design processes and design "what can be" to meet stated deficiencies in the process to advance the capability of the process.

- Step 5 - Apply IDEFo procedures.

By its nature the IDEFo development process is iterative and requires extensive interaction among analysts, systems engineers, and subject matter experts (SME). To help ensure the quality of IDEFo products E-Tech used a process which involved reviews and refinements by analysts, systems engineers, and SMEs. Figure 3 shows this process. The process involved a flow from the analyst to a systems engineer, who served as a system integrator, and then to the SME and back to the analyst. Revisions and interactions took place during this process as required. The next interactions were between the analyst and the systems

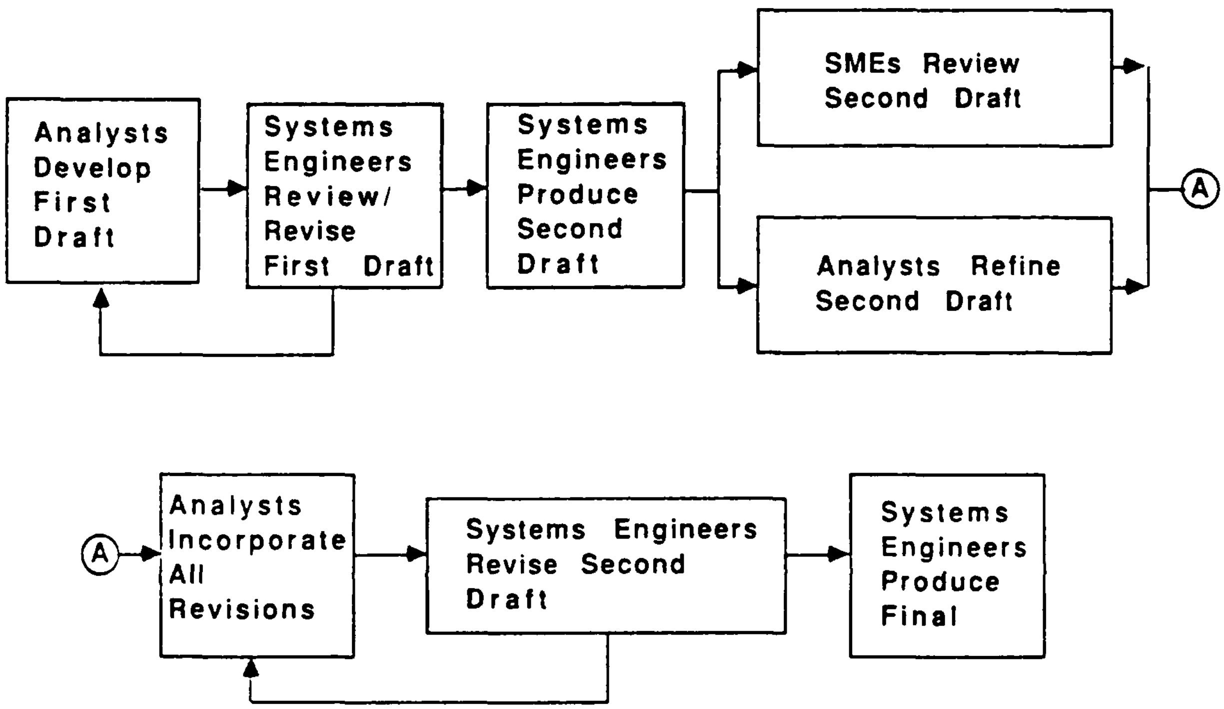


FIGURE 3. IDEFo development process used to produce the TRASER architecture.

engineer after which the IDEFo diagram was put into final form. Through this process the TRASER team was able to reduce the probability of errors due to technical inaccuracies and to check the quality of the IDEFo diagrams.

TRASER-Specific Definitions

As part of the technical approach the TRASER team developed a set of definitions of terms as they apply to TRASER. These definitions are intended to facilitate understanding of the TRASER concept and its components. For the most part they are terms which have general usage in training research, but which may have different connotations within various parts of the training community. This set of definitions is not intended to include all training terms related to TRASER, but to provide definitions of selected key terms. The definitions are in Appendix F. In addition in Appendix F, there is a set of definitions applying specifically to embedded training. The reader needs to refer to Appendix F and become familiar with these definitions before proceeding.

Embedded Training

Embedded Training (ET) is a pertinent issue in training research and development. Due to Army policy that ET must be considered in new weapon system developments and Product Improvement Programs (PIP), ET will become an increasing consideration in the design of new weapon systems and must, therefore, be considered very early in concept formulation of both the weapon and training systems. Since ET is such a significant topic in both weapon and training system design, it has been included as a significant consideration in the top-down integrated analysis of ITS development and in the design of TRASER. In this report ET is integrated into the broad TRASER architecture discussed in the next section of this report and shown in the IDEFo diagrams in Appendix D. It is also treated independently in Appendix G. This appendix contains detailed discussions of TRASER's approach to ET with particular reference to previous ARI and PM TRADE ET research.

Results

The primary result of this project is the Army ITS design architecture shown in the IDEFo diagrams in Appendix D of this report. These diagrams portray the ITS design process as part of the acquisition of major Army weapons systems. They display in a top-down format a totally integrated training system design process. The integration contained in the architecture pulls together the many parts of ITS development into one ITS development model.

The IDEFo diagrams also provide the basis for identification of points in the acquisition process at which TRASER will support ITS design. Candidates for these points of support, referred to as intervention points, are discussed later in this section of the report. The IDEFo diagrams also identify input, output, and process data required to define TRASER processes and data requirements. Discussions of TRASER data requirements and supporting information on potential data sources are also discussed later in this section of the report.

Although development of the architecture in the IDEFo diagrams was the major focus of this project, there were other significant results. These results included a comprehensive listing and definitions of training system design elements for use in specifying the elements of an ITS; approaches to considering embedded training (ET) as part of ITS design; identification of organizations which will benefit from use of TRASER; and proposed innovations in the ITS design process resulting from the TRASER analysis. These results are discussed later in this section of the report.

TRASER System Architecture - Results of the IDEFo Systems Engineering Process

The IDEFo systems engineering process produces a hierarchical decomposition which starts with one high level activity (block). This activity is successively decomposed into its components until the lowest reasonable level of detail has been reached. The result is a large hierarchy emanating downward from one block to lower and lower levels of multiple blocks which form the hierarchy.

Figure 4 is the highest level activity in the TRASER architecture; that is, it is the top block from which the hierarchy emanates. This is also the first IDEFo analysis page in Appendix D. It is Node A-0, indicating that it is the highest level activity and is titled "Produce and Refine Optimal Integrated Training System Design." In the IDEFo diagrams the title expresses an overview of the activities conducted in that diagram. As shown in Figure 4, the goal of the TRASER system is

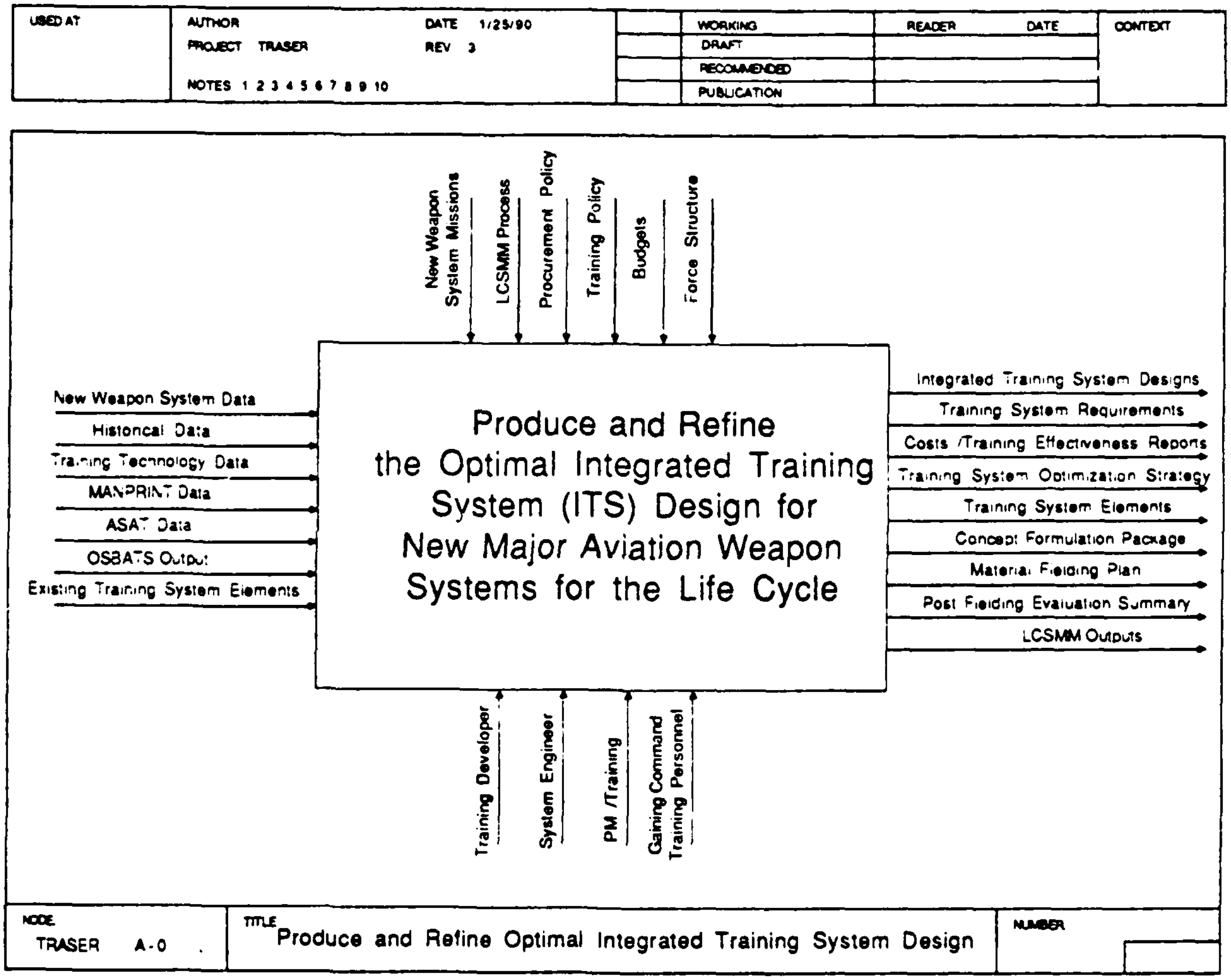


Figure 4. IDEFo Diagram of the highest level activity in TRASER.

to produce and refine an optimal ITS design for the life cycle of the new weapon system under the LCSMM.

This top-level activity was decomposed into four activities at the next level. These activities define four major portions of ITS design starting at milestone 0 and ending with support of the implemented ITS. In between are two activities for continued definition of the ITS in parallel with development of the weapon system. Figure 5 shows these four portions of ITS design in relationship to milestones in the LCSMM. The first module corresponds to the Concept Exploration Phase which lasts from Milestone 0 to Milestone I. The next module corresponds to the Demonstration and Validation Phase which is bounded by Milestone I and Milestone II. The third module corresponds to the Full Scale Development Phase and start of the production phase which spans the Milestone II through Milestone III era. The last module concerns support of the ITS design after IOC. Figure 6 shows the four-block second level of the hierarchy. Descriptions of each of the four blocks are:

- Initial Notional Training System. The purpose of developing an ITS design in the Concept Exploration Phase is to get training established early in the new weapon system program so that sufficient time is created to identify and fully address major training issues, establish an ITS that represents improvement or advancement compared to historical designs, and create an adequate budget for training based on valid requirements. Since these functions occur very early in the LCSMM process, the output of this stage is a notional concept of ITS design.

- Baseline Integrated Training System Design. In the Demonstration and Validation phase, the goal is to move from a notional concept of the ITS design (which is based mostly on historical and generic data) to a baseline ITS concept, based on rigorous SAT analyses and much greater information about the new weapon system. TRASER users will refine the notional training system developed during Concept Exploration. For this reason, the BTA notional ITS design will be retained and brought forward as an alternative design in the continuing CFP and CTEA portion of demonstration and validation activities. The output of the demonstration and validation phase will be used to assist in procuring the actual ITS during Full Scale Development.

- Actual Training System Design. In this phase of development of a weapon system (Full Scale Development) a contract is issued for development of a detailed ITS design. The ITS design includes items to be developed by the contractor and items to be developed by the

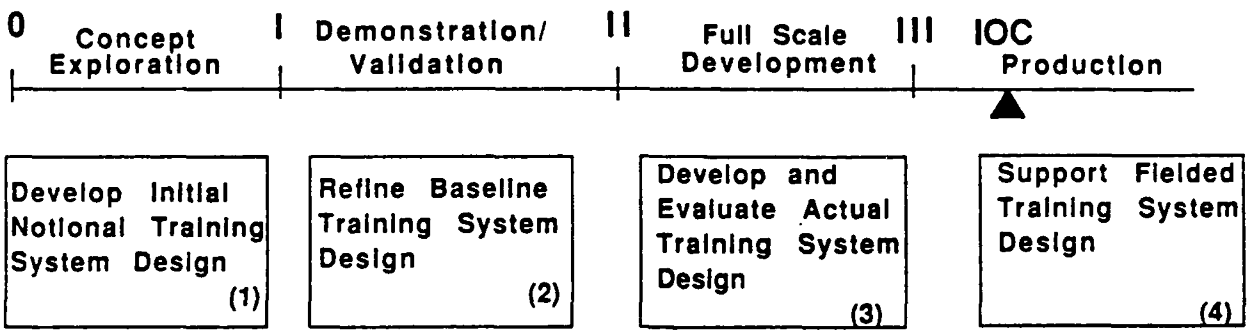


FIGURE 5. Relationship of the four major TRASER analysis blocks to milestones in the LCSMM.

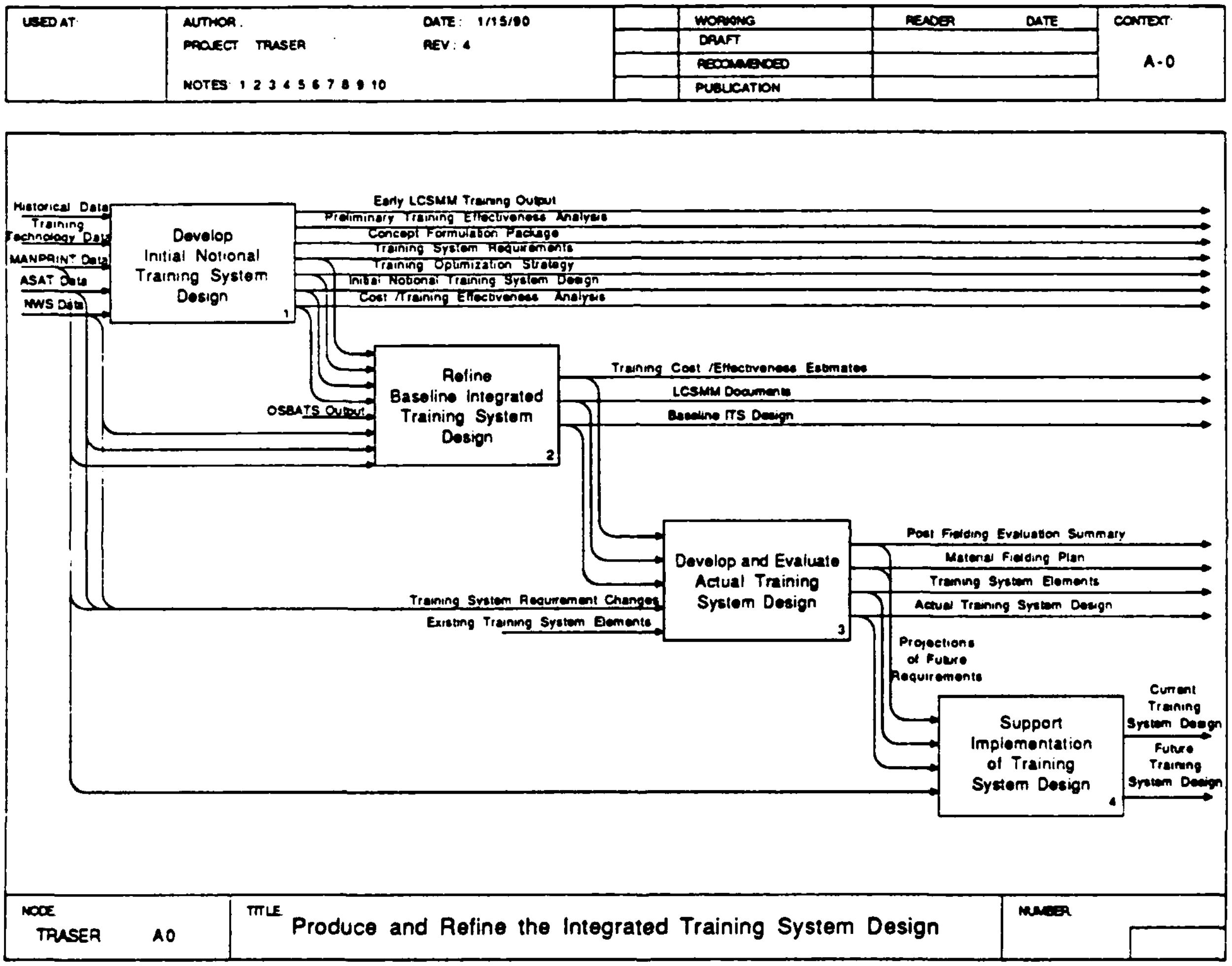


Figure 6. IDEFo Diagram of the second level of the TRASER analysis showing the four major TRASER analysis blocks.

Government. This design is submitted to the government for review at various points in ITS development. The design then becomes the specification for the ITS, parts of which may be developed by the contractor and parts by the Government.

- Implementation of Training System Design. By IOC (early in Production) the operational ITS has been fielded. At this point, the long process of maintaining and updating the ITS to resolve performance deficiencies and meet changing requirements begins.

The four second-level activities became the key divisions for performing the IDEFo analysis. Overviews of the analyses of each of the four major activities are shown in Figures 7 through 10. These figures are IDEFo Visual Tables of Contents (VTOC). They show the progression of the analysis downward from each of the four major activities. Each figure shows the decomposition of one of the four blocks. These VTOC diagrams represent an easy means of understanding the TRASER architecture which is contained in 199 IDEFo diagrams. Appendix D contains the IDEFo diagrams for each of the blocks in Figures 7 through 10. Accompanying each of the diagrams in Appendix D is a narrative description which explains the process depicted in the diagram.

Training System Integration

The systems engineering (IDEFo) methodology provided the tool for an integrated analysis. By using the IDEFo process the TRASER team was able to depict Army ITS design, showing all major components and their relationships. In so doing the TRASER team was able to accomplish the total integration discussed in the Introduction to this report. Figure 11 is an overview of this integration. It shows the TRASER ITS design concept in which there is integration across MOS, types of training, levels of training, courses, and training system design elements.

As shown in Figure 11, all courses, exercises, methods, media, facilities, consumables, performance measurement systems, support personnel, documents and training management components of a training system are identified for one MOS. This is shown along a row. The selected set of components and design elements from the taxonomy of training system design elements represents a training system design. These design elements are discussed later in this section, and listed and defined in Appendix E. When these same components and elements are considered across several MOSs, the term Integrated Training System (ITS) is used. Thus, designs are integrated within and across MOS to gain efficiency.

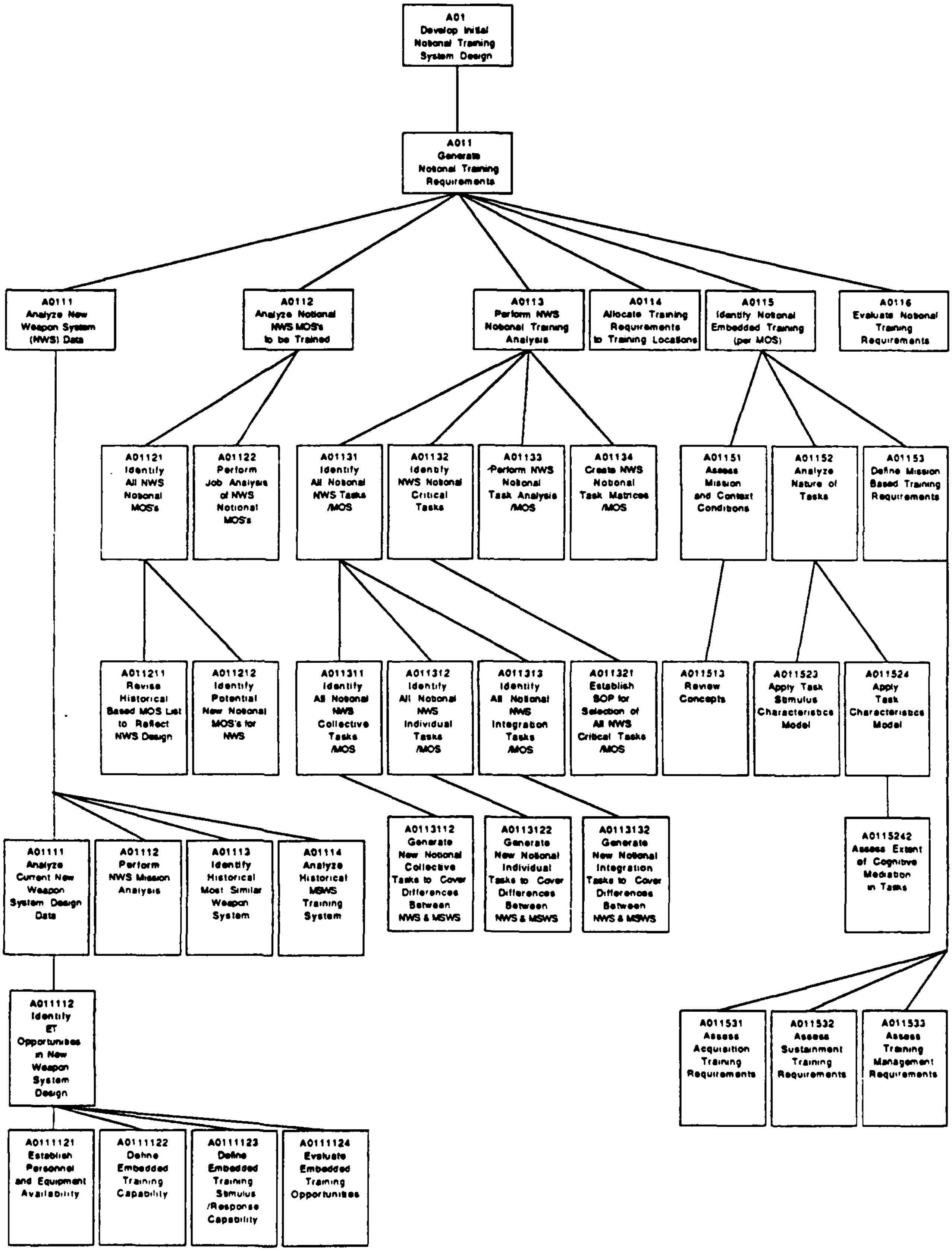


Figure 7. VTOC for initial notional training system design analysis

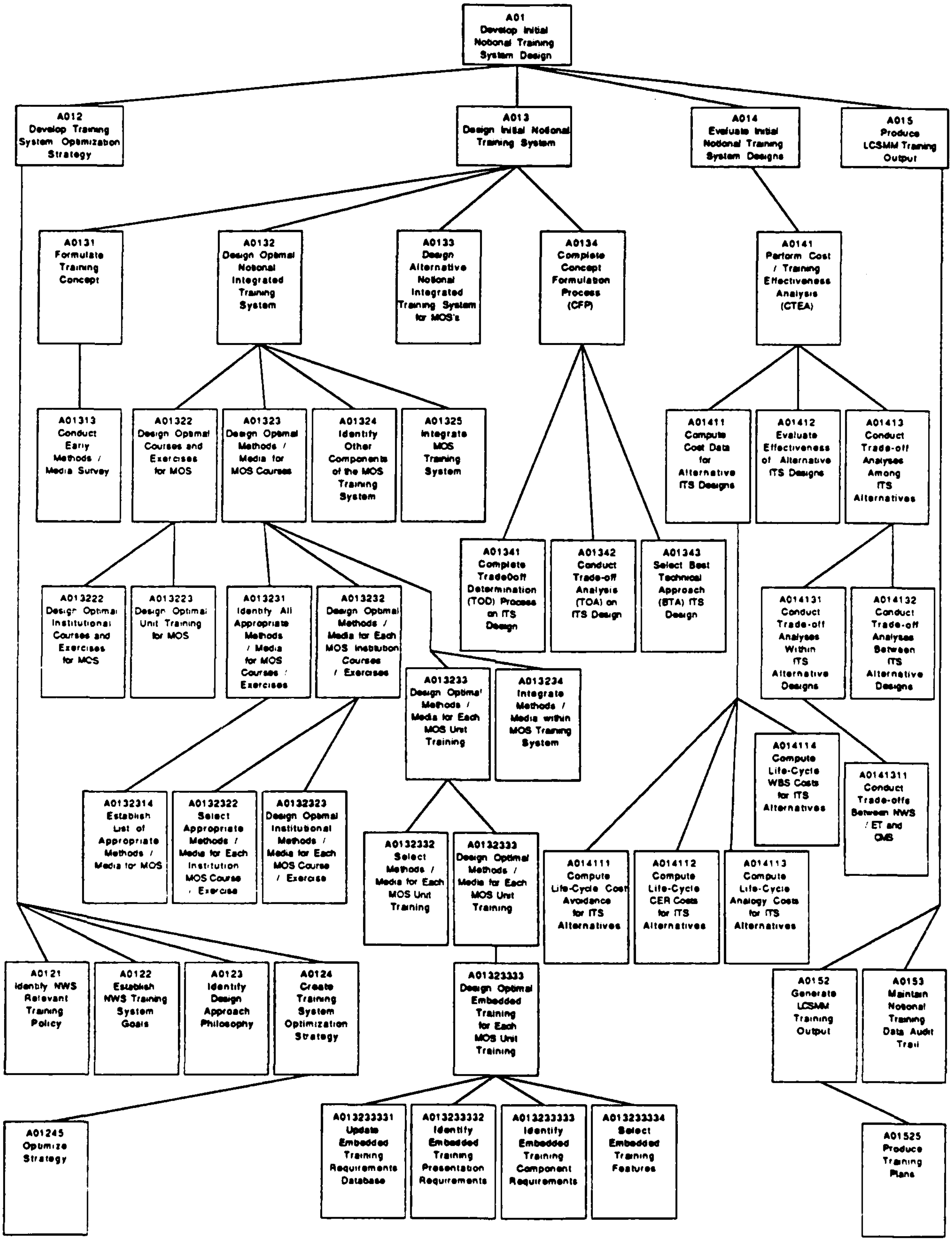


Figure 7. VTOC for initial notional training system design analysis, continued

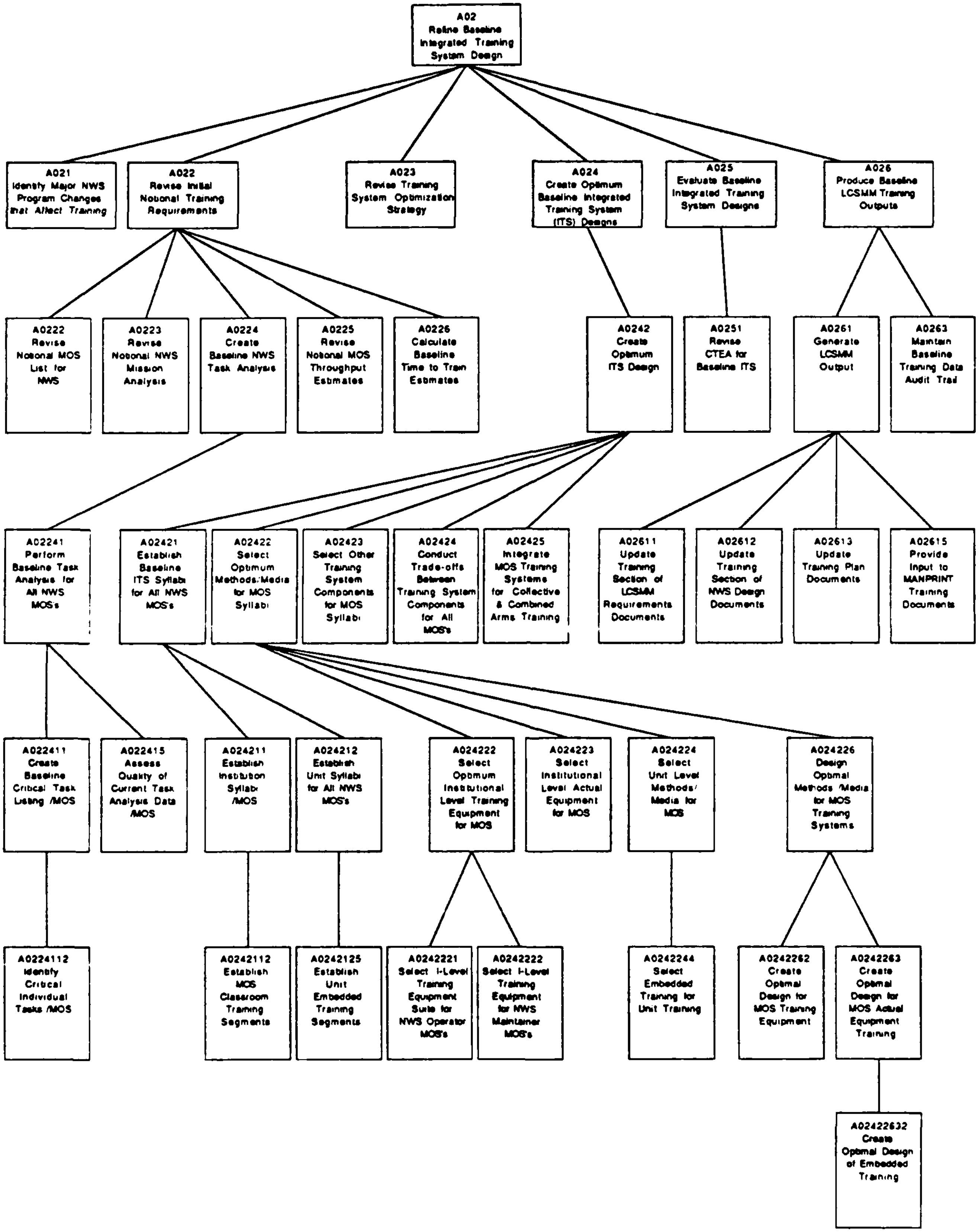


Figure 8. VTOC for baseline training system design analysis

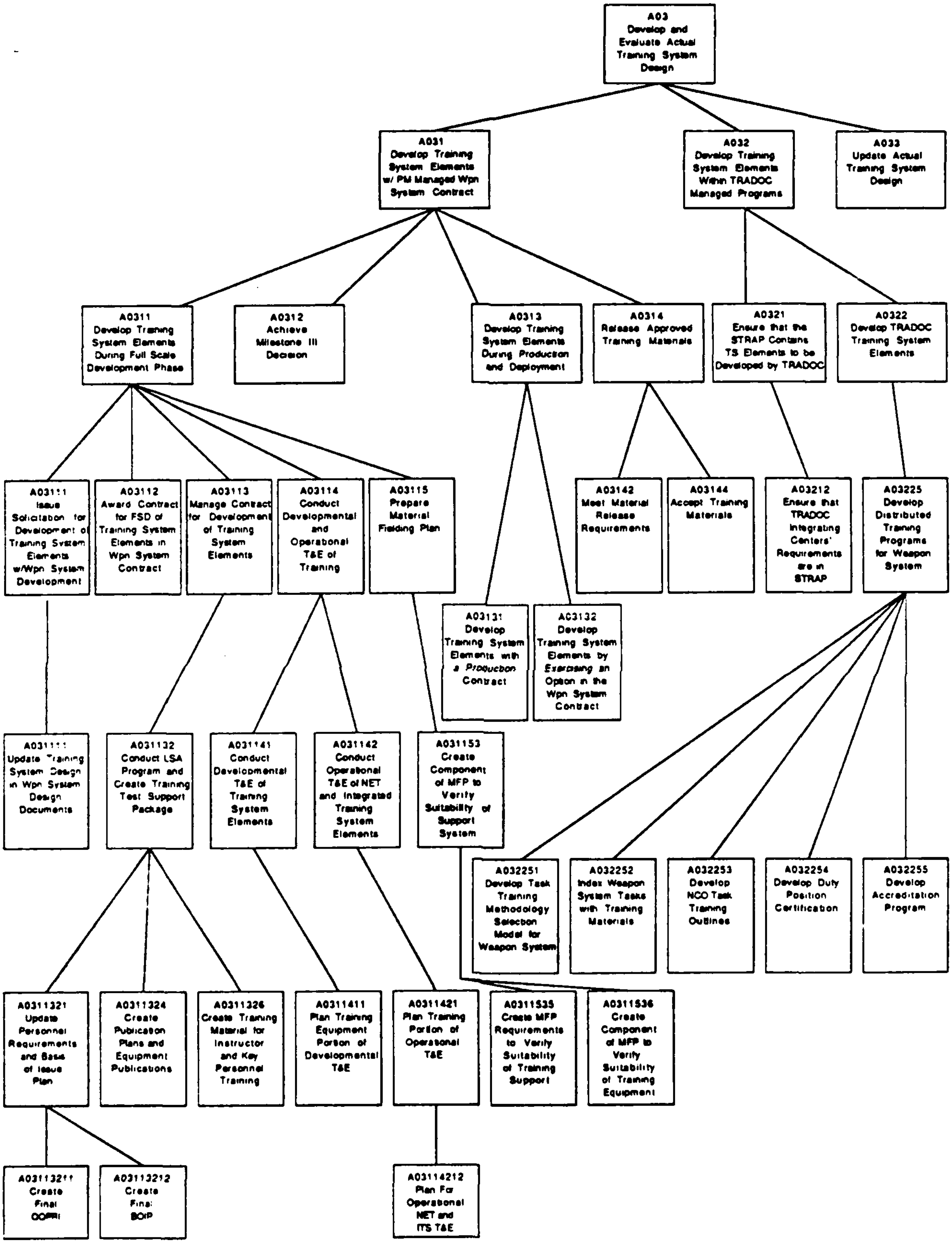


Figure 9. VTOC for actual training system design analysis

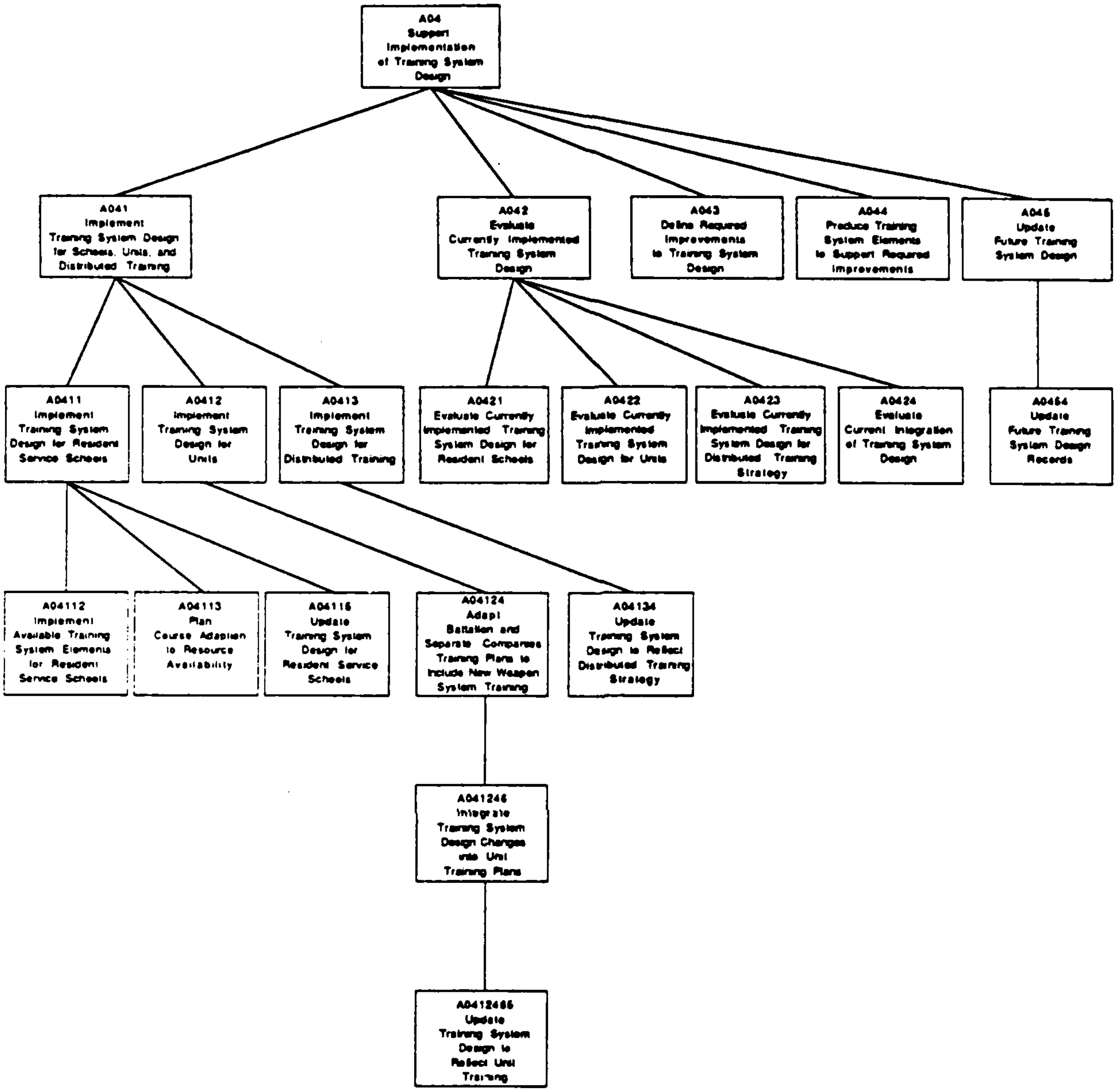


Figure 10. VTOC for fielded training system design analysis

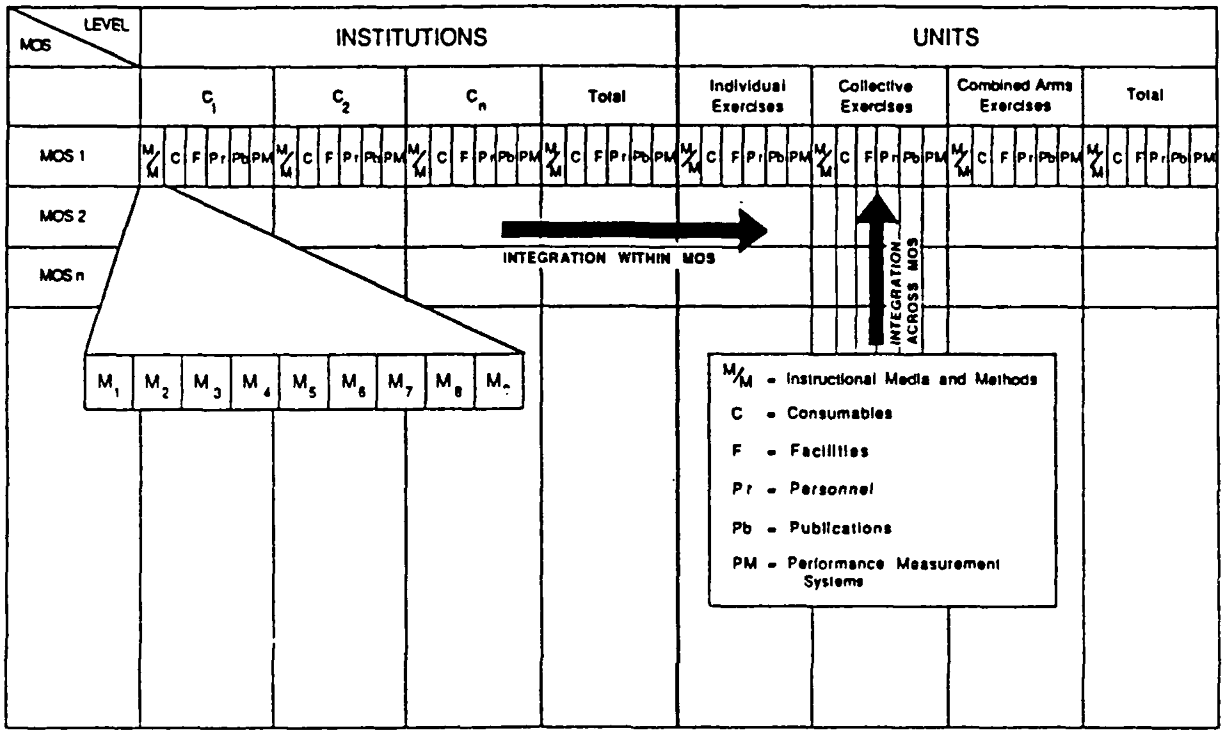


FIGURE 11. TRASER ITS design concept showing integration across MOS, levels of training, types of training, courses and training system design elements.

TRASER's approach to integration also includes integration of training and weapon system development processes, training development tools, embedded training, and data. Results of each aspect of TRASER integration are discussed in the following paragraphs.

Individual, Collective, and Combined Arms Training. The top-down approach to training development considers training as a continuum with individual training largely functioning to prepare soldiers for collective training and then for combined arms operations. Individual training is also integrated into collective training to provide remediation on individual skills and to provide building blocks of related individual, collective, and combined arms skills. This process yields an ITS in which individual, collective, and combined arms training are integrated to optimize each type of training. Figure 11 shows this integration in the courses at institutions and exercises at units. In the IDEFo diagrams in Appendix D the analysis under Design Optimal Notional Integrated Training System (A0132) is the source of the integration of individual, collective, and combined arms training. ITS developed under the principles of TRASER will have optimized, integrated individual, collective, and combined arms training.

Institutional, Unit, and Distributed Training. In the TRASER approach, institutional and unit training are treated as a continuum. Institutional training precedes unit training, qualifies soldiers in specific jobs, and prepares soldiers for unit training. The continuum by MOS is shown from left to right in Figure 11. In the IDEFo diagrams in Appendix D the analysis under Design Optimal Notional Integrated Training System (A0132) is the source of the integration of institutional, unit, and distributed training. Note that this is the same part of the IDEFo analysis referenced for integration of individual, collective, and combined arms training. This is because, under the TRASER approach, all levels and types of training are considered together during total ITS design.

Integration of institutional and unit training is implemented during ITS design in that one is not designed without consideration of the other. The new emphasis on using distributed training to support institutional and unit training, as well as independent study, is expressed and integrated with other forms of training in this analysis. For example, decisions on the contents of unit training may affect the contents of institutional and distributed training.

Training Across Each Weapon System MOS. The TRASER concept of MOS training considers all MOS-related training of any type at any level. This begins with institutional training to meet MOS qualifications and continues during unit training as long as a soldier performs in a given MOS. It includes individual and

collective training, and covers the operation, maintenance, support and employment of a NWS. Figure 11 depicts MOS training along the rows. In the IDEFo diagrams in Appendix D the analysis under Design Optimal Courses and Exercises for MOS (A01322) is the source of the integration across each weapon system MOS. This is a branch under Design Optimal Notional Integrated Training System (A0132) which was the source for integration of individual, collective, and combined arms training and institutional, unit, and distributed training. Of note is the total integration of all aspects of ITS design under the A0132 branch of the analysis. An ITS developed under the principles of TRASER will have integrated MOS training at all levels.

Training Development and the Weapons Systems Development Processes. The TRASER analysis covers all phases of the LCSMM from Milestone 0 through fielding and support. It depicts major points in weapon system development at which training development activity should take place. It is at these points that TRASER will be used to either perform or support decisions. Because the ITS development architecture covers the complete LCSMM and TRASER is intended to function at key points during the LCSMM at which training actions are required, TRASER provides integration of weapon and training systems development. This integration of training development and weapons systems development is shown in Figure 6, which shows the four major divisions in the TRASER analysis, and in Figure 5, which shows the parallel between the four major TRASER divisions and milestones in the LCSMM.

TRASER also integrates training policy with ITS development processes. Figure 4, the top block in the TRASER analysis, shows policy inputs. These policy inputs filter down throughout the ITS development activities shown in the lower level IDEFo analyses. The result of the parallel development of training and weapons systems is that ITS design begins very early in the acquisition process, continues with refinements as the weapon system matures, and culminates with an effective ITS ready at IOC. The processes and products reflect the implementation of training development policies including those that are specific to a particular weapon system or family of weapon systems. Appendices H and I contain descriptions of the Combat-Based Requirements System (CBRS) and the LCSMM, respectively. They provide overviews of how these processes work and the ways in which TRASER will interact with them in integrating training and weapons system development. An example of integration of the CBRS in TRASER is the use of CBRS data in A01151, Assess Mission and Context Conditions.

Training Development Tools. A goal during the TRASER analysis was to make the maximum use of other training development tools that are currently being developed. These tools include OSBATS (Sticha et al., 1988) ASAT (Automated Systems Approach to Training (in preparation), and the Training

Constraints training equipment. ASAT establishes collective training requirements. T-CON offers another mechanism for identifying a historical-based training system design.

The TRASER architecture identifies types of data obtained from these tools and TRASER data provided to them. TRASER makes maximum use of data these tools are designed to produce and, in turn, provides data for their use. Figure 4, the top block of the analysis, shows inputs from OSBATS, ASAT, and MANPRINT (of which T-CON is considered a part). Specific interfaces with these tools occur at many different points in the IDEFo analysis. For example, ASAT output is an input in A0111 (Analyze New Weapon System Data); MANPRINT data are inputs in A01111 (Analyze Current New Weapon System Design Data); and OSBATS data are inputs in A024 (Create Optimum Baseline Integrated Training System Designs).

Training System Design Elements. An ITS is an integration of a large number of diverse elements. In support of the TRASER concept of an ITS, the TRASER team developed a comprehensive taxonomy of these diverse training system design elements. Any ITS designed by TRASER will be composed of combinations of the ITS design elements. Appendix E contains the ITS design element taxonomy and definitions of the design elements. Figure 11 shows the six categories under which the elements are grouped in the taxonomy. TRASER ITS will be integrated around these design elements. Each ITS will consist of courses made up of an optimum combination of these elements consistent with strategies, policies, and constraints.

The training system design elements are intended to be a comprehensive compilation of the elements which must be considered during the design of a training system. They are grouped under the major headings of instructional media and methods, consummables, facilities, personnel, publications, and performance measurement (Figure 11). Under each of the major headings, categories are broken down into increasing levels of detail until the specific selection candidates are listed under the lowest category level.

These elements account for virtually all of the categories of training decisions which must be reached during ITS design. They define the types of decisions that TRASER must support. In addition, it is the view of the TRASER team that the TRASER training system design elements are the most comprehensive listing of its type in the training design and research communities, and thus constitute a significant contribution to

listing of its type in the training design and research communities and a significant contribution to both training system design and research, independent of TRASER.

The TRASER training system design elements have been reviewed extensively by knowledgeable personnel from different organizations. These organizations have included ARI, PM Trade, Training Performance and Data Center (TPDC), Army Training Support Center (ATSC), and members of the TRASER team with staff Army SMEs.

Embedded Training Integration. The TRASER analysis treated Embedded Training (ET) as an integral part of ITS design. This integration is shown in the architecture resulting from the system engineering analysis. ET is integrated into the design of the notional and baseline training systems. In the IDEFo diagrams in Appendix D this integration of ET into ITS design is shown in several places. The analysis under Identify Embedded Training Opportunities in New Weapon System Design (A011112) is the initial consideration of ET during development of the initial notional training system. Other points of ET consideration are shown in A0115 (Identify Notional ET Requirements (per MOS)), A01323333 (Design Optimal Embedded Training for MOS Unit Training), A0242125 (Establish Unit Embedded Training Segments), A0242244 (Select Embedded Training for Unit Training), and A02422632 (Create Optimal Design of Embedded Training).

As shown in the systems engineering analysis, consideration of ET should begin very early in the acquisition process. This early consideration is essential to enable the numerous tradeoffs required as part of making ET decisions. Once made, the decision to include ET is factored into the ITS design and may have a significant impact on ITS strategy. Appendix G contains discussions of ET analyses and considerations involved in the early decisions on selection and implementation of ET.

Data Integration. A major output of the systems engineering analysis was identification of data requirements to support TRASER. In the IDEFo analysis, inputs to training design processes are data requirements for TRASER. In Figure 2, which shows relationships in the IDEFo process, data are the left entries into the activity block. In each block in the IDEFo diagrams in Appendix D, data input requirements for that activity are shown by the left-entry arrows.

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[1] Since the taxonomy consists of concrete design elements, training content, a major factor in training design decisions, is not included as a design element. Content takes tangible form in courseware, lesson plans, Programs of Instruction, and other elements which are included in the taxonomy.

By assessing the data requirements, as shown in the input data arrows, and comparing these requirements with the contents of candidate data sources, TRASER analysts were able to determine the feasibility of providing the data needed by TRASER. The result was an integrated approach to TRASER data in which data will be drawn from multiple sources. These sources include the TRADOC TRAMOD data system, Training Performance and Data Center (TPDC) files, and documents developed by the Government and contractors as part of the acquisition process. The TRASER team determined that through existing data sources and those scheduled to be operational in the next few years, the potential exists to meet TRASER data requirements. Appendix J contains a detailed discussion of the data assessment process and the rationale used to make the decision on data feasibility.

Potential TRASER Intervention Points

After the System Engineering portion of the research was completed, it became possible to survey the various functions of the IDEFo architecture to find prospective points where one might intervene in the LCSMM process and automate various functions to enhance user performance of those functions. In this section, potential intervention points in the LCSMM process are identified. For the purposes of this report, an intervention point is defined as a function or related set of functions in the evolutionary ITS design process that is amenable to either partial automation (i.e., aiding) or complete automation where automation will make the process more effective or efficient. This preliminary analysis of intervention points was conducted to provide ARI and PM TRADE with some "look-ahead" notions about the potential of the TRASER model as an aid to Army training managers, developers, system engineers, and training officers.

The intervention points presented here are for the Concept Exploration Phase (Phase I) of the LCSMM process. As a result of the preliminary analysis of potential intervention points, it appears that Phase I may be the most important phase for TRASER use. Additional potential intervention points for Phases II, III, and IV are presented in Appendix K. The following paragraphs contain potential TRASER interventions during Concept Exploration.

Establish Training Requirements. The process of establishing notional training requirements shortly after Milestone 0 represents a good opportunity for intervention. In the IDEFo diagrams in Appendix D these interventions will occur in certain of the processes in the analyses under A011 (Generate Notional Training Requirements). Below are discussions of how the intervention process to establish training requirements might work:

- Identify the most similar existing weapon system to the new weapon system. Using standard formats for describing the sub-systems of all major weapon systems in the Army inventory and the new weapon system, a historical weapon system or components of various weapon systems can be identified automatically. In the IDEFo diagrams in Appendix D this activity is shown in A01113 (Identify Historical Most Similar Weapon System (MSWS)). Selection would be based on weapon system missions and design features. In the case of the example proponency, aviation, this comparison would yield the existing aircraft or subsystems of various aircraft that are the most similar to the proposed new aircraft, based on the chosen selection parameters.

- Determine the ITS design and supporting data for the most similar weapon system or subsystems of various weapon systems. These data would include MOSs trained, MOS tasks, courses, and exercises, facilities used, methods and media, consummables, support personnel, and other components, as well as actual throughput per MOS and training time per MOS. In the IDEFo diagrams in Appendix D this activity is shown in A01114 (Analyze Historical MSWS Training System). To determine training requirements for the NWS, historical similar weapon system MOSs and MOS tasks would be used. The remainder of the similar weapon system data represents a "first cut" at the notional ITS design for the new weapons system. This "first cut" would be used in another major function, ITS design for the NWS.

- Identify differences between the new weapon system and the most similar existing weapon system. Using standard formats for conveying design and mission information about weapon systems, as well as information on what is known about the Mission Equipment Packages (MEP) of the new weapon system, differences in design could identified automatically. In the IDEFo diagrams in Appendix D this activity is shown in A011113 (Analyze Current New Weapon System (NWS) Design Data. Differences expressed as "new technology" could be used to consider whether new notional MOSs might be required to operate or maintain the new weapon system.

- Create new notional MOSs, if necessary. This task would require user input on MOS structuring and criteria for creating new MOS. Identification of possible new MOS would be based on differences in the new and existing weapons systems. In the IDEFo diagrams in Appendix D this activity is shown in A011212 (Identify Potential New Notional MOSs for NWS). The Notional MOS list would be used as input to the formal Department of the Army force

structure process. The actual MOS list resulting from the force structure process would be provided to training through the QQPRI during Phase II (Demonstration and Validation).

- Create critical task data for areas of difference between the new weapon system and the most similar existing weapon system. Some relevant task data may be found in the Training Technology Database (within TRASER), some from SME input, some from vendors of MEPs, and yet others from other Armed Service databases (e.g., in TPDC). These data would be used to revise the task data from similar weapons systems and components. This process would create the notional tasks for the new weapons system. In the IDEFo diagrams in Appendix D this activity is shown in A01122 (Perform Job Analysis of NWS Notional MOSs, A01131 (Identify All Notional NWS Tasks per MOS), and A01133 (Perform NWS Notional Task Analysis per MOS).

- Compute throughput per MOS. This function probably could be computed automatically, given information on the number of copies of the new system to be produced and other data, such as historical turnover factors. In the IDEFo diagrams in Appendix D this activity is shown in A0112 (Analyze Notional MOSs to be Trained).

- Compute "time to train" per MOS. This might be computed with user input or using defined parameters, such as time to train per task, or it may be a given, stemming from Army training policy (e.g., new weapons system training cannot exceed similar existing weapon system training).

- Allocate MOS critical tasks to training location. This task could be accomplished automatically by adopting the historical allocation in the similar existing weapon system ITS, and modifying it as appropriate based on inputs, such as Army policy and notional task data. In the IDEFo diagrams in Appendix D this activity is shown in A0114 (Allocate Training Requirements to Training Locations).

Many of the notional training requirements data elements could be generated automatically. Minimal user input would be required at a few points. Similar approaches have been investigated in DoD. These include the Navy's CASDAT (Ace, 1982), ARI's T-CON (Ditzian et al., 1987), and ASAT (Automated Systems Approach to Training Functional Specification, 1988). These examples will provide a baseline for automating the process of developing the notional training requirements data elements in TRASER.

Develop ITS Optimization Strategy. The ITS Optimization Strategy is a new innovation and potential intervention point. This strategy is shown in the IDEFo diagrams in Appendix D under the analysis of A012 (Develop Training System Optimization Strategy).

The purpose of the optimization strategy is to provide a mechanism that ensures that the new weapon system program goals, policy, and circumstances are considered in the design of the new ITS, and further, are considered in the procurement process. No formal document was identified in the review of Army training regulations that directly addresses the need for this mechanism. The activities that have been incorporated into optimization strategy development were performed by early PM/Training and Training Developers in the Army LHX program. They were not performed as formally or completely as specified in TRASER.

The optimization strategy module would formalize the planning that training personnel should engage in if new weapon system training programs are to result in Army training design advancements, while also being responsive to the overall requirements of the new weapon system program. This optimization strategy would be the mechanism or vehicle by which historical ITS designs are transformed into a new ITS design that is either more modern, less costly, more efficient, more flexible, or more effective than its predecessor, while benefiting from experience gained through the predecessor.

The first three functions involved in developing an optimization strategy probably would have to be performed by the TRASER user, with the aid of prompts. These three functions involve identifying relevant new weapon system program policy that affects training (A0121, Identify New Weapon System Relevant Training Policy), setting ITS goals (A0122, Establish NWS Training System Goals), and identifying a design approach philosophy that would guide ITS development (A0123, Identify Design Approach Philosophy (s)). Based on the assumption that there are five variables on which an ITS design could be optimized (i.e. modernization, cost, efficiency, flexibility, and effectiveness), five design approach philosophies have been identified and will be incorporated into TRASER. They are:

- Design to Cost
- Design for Maximum Effectiveness
- Design for Maximum Efficiency
- Design for Maximum Flexibility
- Design for Modernization

Each of these design approach philosophies has associated with it unique design prompts which could be used to skew the ITS design toward the selected aspect of optimization. For example, the Design to Cost philosophy set of prompts would contain words like "generic" and "off-the-shelf". These words, applied to ITS design elements such as simulators, would create concepts that could be incorporated into procurement packages to reflect Army training needs, e.g., procure generic, generalized, commercially-available part-task simulators and trainers.

In the development of the core of the optimization strategy, TRASER would offer additional automated assistance. The optimization strategy would have several key dimensions or facets along which the ITS design could be manipulated. Three such facets have been tentatively identified:

- Media Intensity - the extent to which new weapon system program policy or circumstance forces the normal ITS toward exaggerating a specific instructional medium, i.e., simulator intensive design, embedded training intensive design, or actual equipment intensive design.

- Training Location Intensity - the extent to which new weapon system variables dictate a skewed allocation of MOS critical training tasks to either the Institution or the Unit, i.e., unit intensive training or institution intensive training.

- Automation Intensity - the extent to which normal human functions in the ITS will be supplanted by computers, i.e., automation intensive training or human intensive training.

Other facets of the optimization strategy may be identified during additional TRASER design efforts. These tenets of the strategy, once identified, would be used in the design process as "forcing functions" that would skew the design of the ITS to align more closely with new weapon system policy and circumstances as expressed in the strategy. For example, if simulator intensive and unit intensive options are selected, the ITS design would reflect increased application of simulators for unit training. When the design prompts are applied in this example using the "Design to Cost" option, the ITS design would be skewed by the strategy, and subsequent new weapon system procurement packages for the new ITS would reflect the need for more low-cost simulators at the units than would normally be the case if such a strategy were not used.

Generate Alternative ITS Designs. A notional ITS design could be automatically created by capturing the ITS components and elements from historical similar existing weapon system ITS data. This can be revised based on differences between the new

and existing weapons systems. Then by applying the result of the optimization strategy, alternative ITS designs could be created that are variations of the historical ITS design. For example, selection of a simulator intensive design (and resultant lowering of actual equipment and live fire ranges) would create a design that is very different from one that emphasizes actual equipment or range use. In the IDEFo diagrams in Appendix D generation of alternative ITS designs is shown in the analysis under A013 (Design Initial Notional Integrated Training System).

Method and media selection is an important part of ITS design. Automation of this process is well within the state-of-the-art. Any one of a number of automated method and media selection systems, such as TRADOC's Media Selection Model (Melton and Sheboy, 1989), could be modified and expanded for use in TRASER. Thus, media selection is a potential intervention point.

This automated capability to support development of alternative ITS designs would fulfill part of the concept formulation process (i.e., the TOD phase), which requires creation and evaluation of alternative designs. The process of altering the optimization strategy and creating new alternative ITS designs could be repeated as often as the user desires. Thus, generation of alternative ITS designs could be a major intervention point for TRASER.

Evaluate Alternative ITS Designs. As required by the CFP, a TOD and TOA must be conducted on the alternative ITS designs. In the IDEFo diagrams in Appendix D evaluation of alternative ITS designs covering these and other tradeoffs is shown in the analysis under A014 (Evaluate Initial Notional Training System Designs).

Tradeoff studies are difficult to automate because valid, objective criteria required for such studies are difficult to generate and justify. For this reason, tradeoff studies are done by humans, using subjective criteria to make tradeoffs and select the BTA. One tool that could be viewed as an aid to the evaluation process is the Intelligent Training Resource Optimization Tool (ITROT) which has been used by the ARI Ft. Bliss Field Unit to conduct tradeoffs between numbers of different media and throughput in institutional training (Muller, 1987).

Another aspect of evaluation is the CTEA process in which cost and effectiveness are assessed and traded off against one another. If valid cost data could be captured for TRASER components and elements, and if valid, objective measures of the training effectiveness of ITS component elements could be obtained, then the CTEA process could be automated. The result would allow for an automated CTEA process which results in a BTA

selection and cost and training effectiveness measures to support the choice. However, neither good cost data nor valid training effectiveness measures are available at present. The TPDC, TRAMOD, and NTSC's Training Resource Analysis Support System (TRASS) databases are expected to capture these data in the next few years. At that time intervention into the CTEA process might be more promising.

Develop Training Output. The last step of the notional ITS design process is to create training requirements documents called for in the LCSMM procurement process. This output includes sections of new weapon system requirements documents, design documents, plans, input to related processes (e.g., MANPRINT), and an audit trail. In the IDEFo diagrams in Appendix D these documents are shown as outputs at various points in the A01 analysis (Develop Initial Notional Training System Design).

Since the format of these output requirements is standard and well established, this function represents a good opportunity for intervention. Training data generated in TRASER could be automatically identified and formatted for output to specific LCSMM documents. Some human intervention would be necessary to "fill in the blanks" and validate the material before it is promulgated.

User Requirements

During the definition of user requirements, potential users provided input on potential characteristics and capabilities of TRASER. These include the following:

- Retain usable "corporate memory" from each ITS development program and thus reduce the costly effect of turnover of Army training developers.
- Collect historical data from previous programs into one readily usable, accessible source.
- Reduce training developer workload by making interventions user friendly.
- Assist in maintaining the configuration between the weapon system and the associated ITS.
- Assist in configuration control to ensure that the ITS is fully operable at IOC.

These inputs from potential users provided early information on uses and characteristics of TRASER which, if implemented, would ultimately enhance user acceptance. These and other characteristics should be considered as the TRASER design

matures. More information on potential users of TRASER is presented in Appendix L.

TRASER Innovations

A goal of this study was to improve the Army approach to ITS development by stressing two factors:

- Start training design very early in the acquisition process (at Milestone 0).
- Take a totally integrated approach in which training requirements for all weapon system-specific training are addressed as a set of requirements for an ITS.

Emphasis on these factors led to a set of innovations embodied in the TRASER architecture. Some of these innovations improve the way the Army designs ITS. Others would work toward institutionalizing procedures that are prescribed but often bypassed, not performed in a timely manner, or performed in less than an optimal manner. These innovations which would result from TRASER implementation are described in the following paragraphs.

Comprehensive Integrated Training System Designs Would Be Created. Training system designs would include a comprehensive set of training opportunities for all soldiers involved in the operation, maintenance, support, and employment of the weapon system, including combined arms exercises. Identifying training opportunities for use in schools, units, and via distributed training would be supported. This is an innovative approach in that it concerns a broader range of ITS design elements than presently considered in the early stages of the training design process. The TRASER-supported training system designs would include methods and media, consummables, facilities, personnel, publications, and performance measurement instruments for each training event, ranging from resident school courses to unit drills and combined arms exercises. These designs should prove useful to AMC training developers in preparing the New Equipment Training Plan (NETP) and to TRADOC training developers in preparing the System Training Plan (STRAP).

Alternative Training System Designs Would Be Subjected To Trade-Off Analyses During The Concept Exploration Phase Of Weapon System Development. The result would be careful analysis of the role of ET, simulators, ranges and live fire exercises, training unique ammunition, training simulations (computer war games), National Training Center exercises, and other types of training opportunities that are basically different training options. In these early trade-offs attempts would be made to optimize the methods to be used in achieving required skills by all MOSs associated with the employment of the new weapon system. This

would take place at a time in the development of the weapon system that realistic decisions can be implemented on ET and other high-cost training technologies.

Concurrent Development Of ITS With NWS Development. In order to ensure that the ITS is implemented at IOC, development of the ITS design must start early and maintain currency with the NWS design. Concurrent design, among other things, would also mean that training equipment would match the configuration of the NWS at IOC. By maintaining configuration control with the NWS, ECPs and other major changes to NWS design could be detected early and used to alter ITS design on a frequent basis. The net result would be enhanced training, and thus readiness, shortly after IOC.

Develop And Apply A Formal Optimization Strategy To Guide ITS Design. An innovative feature of TRASER is the conceptualization and use of a Training System Optimization Strategy. The purpose of the Optimizing Strategy is to skew the ITS design towards user-defined optimization variables that reflect policy, limitations, or desires in the NWS Program. Because the strategy affects ITS design and the documents that convey the ITS design, it would ensure that policy is reflected in procurement of the ITS.

Incorporate Embedded Training Early In ITS Development. Very early in the LCSMM process, TRASER users would be better able to identify potential opportunities for applying ET and evaluate those opportunities in the context of the complete ITS. By identifying NWS design features that enable ET and by identifying operator or maintenance training requirements that could be uniquely met by ET, opportunities to apply ET could be systematically considered shortly after Milestone 0. Such an early start would allow ET concepts to be considered and adopted before the design of the NWS is solidified.

Integrate The NWS Training Development Process With Other Army Training Tools. For some time, the Army (notably, ARI) has been developing a variety of tools to aid the training development process. The OSBATS tool is being developed to generate a series of optimized recommendations about the number, type, and capability of training equipment to be incorporated in an ITS. ASAT is being developed to automatically generate collective training requirements, as well as exercises. An innovative feature of TRASER is that it would encourage the use of both tools to increase the efficiency of training design functions.

A Mechanism Would Be Provided For Coordinating Resource Development Across Diverse Agencies. Comprehensive training system designs should include resources to be provided by the Army Materiel Command, and subordinate commands, such as PM

TRADE, as a part of the weapon system development and production contracts. The design should also include the resources to be provided by the Training and Doctrine Command and subordinate commands, such as the Army Training Support Center and the School commands. TRASER would be a tool not only for identifying the comprehensive set of training system design elements, but also documenting the commands responsible for providing these training system elements. This broad picture of the training system development team, and the activities of team members, is not currently displayed. Some of the developers of training system elements tend to be isolated from the larger effort. The display of this information would help establish a community of training developers who are creating the training system for a new weapon system, and would be useful in coordinating the efforts of all team members.

A Detailed Audit Trail Would Be Generated. With the concurrent development of the weapon system and the supporting training system, the training system design evolves over a period as long as ten years. There would be a flow of both military and civilian personnel in and out of the project during this span of time. A record of decisions made, and the substantiating information, will be important in achieving continuity in the project. Many of the documents go through a series of updates, and others bring together data from previously generated documents. Many design decisions are initially made informally, through achieving a consensus in a meeting of individuals who have official responsibility for some aspect of the design process. Retaining the minutes or notes from such meetings is an important part of the record of the project. Immediate and continuous access to the latest version of a report, and well organized corporate history of the project, would be a valuable supporting service of TRASER to all members of the training development team.

Conclusions and Recommendations

The following conclusions and recommendations establish the viability of the TRASER concept and feasibility of developing TRASER into a working system to support development of Army ITS.

Conclusions

This project assessed the feasibility of developing a TRASER-like system. In addition, large amounts of data were accumulated to support TRASER development. As a result of this extensive data collection and analysis effort, it has been concluded that TRASER is feasible and that the Army would accrue major benefits from using TRASER. Specific conclusions are:

It is possible to incorporate TRASER methodology into Army training development procedures without changing existing regulations. Existing regulations require or allow the types of innovations specified in this report. For example, TRADOC Regulation 354-1 requires that tasks be derived from mission analyses. By enhancing the procedures of TRADOC Regulation 354-1 in TRASER, a top-down approach would be assured when TRASER is used. Also, deficient areas in the Army's procedures for developing an ITS design have been addressed in TRASER, thereby improving the process while maintaining the non-deficient areas. These improvements are all allowable by regulation and are feasible within the current acquisition system.

It is feasible to begin training development efforts at Milestone 0, perform useful functions early, and maintain concurrent designs between the new weapon system and the ITS throughout the evolution of the new weapon system design. The IDEFo diagrams and potential intervention points for the Concept Exploration Phase of the LCSMM demonstrate that a notional ITS design could be achieved very early in the LCSMM and be refined as new data on the weapon system become available. With a strong interface between training and NWS design incorporated in TRASER, concurrent development of ITS would be feasible and beneficial.

It was possible to identify preliminary intervention points in the LCSMM process where automation could be used to make TRASER users more efficient and effective. These potential intervention points are identified in this report. Identification of these points was based on the major activities in ITS design during Concept Exploration and on the potential availability of data to support automated and manual processes during these activities. All potential interventions are within the state-of-the-art. Some are supportable through similar previous efforts which could be adapted to TRASER.

<u>It is possible to consider ET at a very early stage and include it in early ITS designs</u>. The IDEFo diagrams integrate ET decisions during Concept Exploration. With early definition of ET requirements ET could be considered as are other media in ITS design.

<u>It is possible to refine an ITS design throughout the evolution of the new weapon system and achieve more cost-effective training than if the design is frozen at a specific point in time</u>. ITS design changes are driven by changes in the NWS. As NWS data change, TRASER would enable detection of these changes and cause the ITS design to change accordingly. The result would be an ITS which is based on the latest NWS data at IOC.

<u>It is feasible to acquire the data required for TRASER operation from existing or soon-to-exist databases, with some exceptions (e.g., training effectiveness data on alternative treatments)</u>. As a result of reviewing TRAMOD and TPDC available and planned data files, it has been determined that most of the TRASER data requirements could be met in the next three to five years. To supplement the available and planned data it would be feasible to create data sources to provide the remaining TRASER data requirements.

<u>It is possible to create and maintain an audit trail and data base of decisions, documents that record decisions, backup data used in making decisions, and the evolving state of the training system design</u>. Establishing audit trails would be a simple procedure. With TRASER prompts and "lock out" procedures the system would maintain an audit trail of user entries and system outputs.

If TRASER were implemented, large benefits would accrue to the Army because of systematic integration of all ITS components and elements. For example, redundant training tasks and training equipment at the institution and units could be eliminated by comprehensive integration of the ITS design. Similarly, omissions in training would be caught through systematic integration. This would increase training effectiveness at all levels.

Since TRASER would track NWS development and cause concurrent design of NWS training equipment, the configuration of the selected training equipment would more closely match the configuration of the fielded NWS, resulting in improved training at IOC. The parallel development of the NWS and ITS designs would also increase the probability that an effective ITS would be in place for implementation at or before IOC.

By integrating TRASER with other tools, such as ASAT and OSBATS, greater efficiency in training development would occur,

perhaps reducing the manpower required for training development. Finally, by using existing training policy, the ITS design could be skewed toward more optimal solutions to further enhance the cost-effectiveness of ITS designs.

Recommendations

It has been concluded that TRASER is feasible and has the potential to substantially benefit Army ITS design. Given these conclusions, recommendations resulting from this project are:

Continue TRASER development. In future efforts the analyses from this project would be used to generate functional specifications for TRASER, including automated interventions in the ITS development process. Using these specifications, the next steps would be to develop, test, revise, and implement a basic version of TRASER.

Identify an organization to sponsor TRASER. This organization should be a user of TRASER and would make TRASER available to other users. The organization would oversee the continual update and refinement of TRASER. This sponsor should become a co-sponsor of the further development of TRASER.

Conduct additional TRASER research. This research would be designed to enhance TRASER effectiveness and could include the following areas of investigation.

- Improve the methodology for describing, measuring, and predicting training effectiveness. The most important theoretical issue left unresolved in TRASER design concerns how to model training effectiveness. Alternative training system designs are not necessarily equal in effectiveness. It is safer to assume that no two designs have exactly equal effectiveness. Without accurate tools to predict effectiveness, one cannot take the position with confidence that a specific design is superior in effectiveness. The traditional approaches to conducting training effectiveness research are prohibitively expensive, and the results to date are suspect. What is needed is an innovative and practical method to deal with the issue, "How well will proposed ITSs achieve their training goals?"

- Expand TRASER to better support the use of non-system training devices in training system designs created during the concept formulation phase of weapon system development. With increasing interest in supporting collective and combined arms training in units, non-system training devices (such as SIMNET, battle simulations, and tactical engagement simulations) are emerging as important tools for integrating the new

weapon into the warfighting force. These non-system devices should be clearly specified in the alternative training system designs subjected to trade-off analyses during the broad concept formulation studies conducted between Milestones 0 and I in the LCSMM. The study of the process of developing non-system devices was outside the scope of the current effort. Creating IDEFo diagrams of a proposed process for considering non-system devices in these broad training system design studies, and then building the required job aids to support the process would be a major step in enhancing the consideration of non-system devices in the training system designs developed with TRASER.

- Develop an ET decision aid for use during concept formulation studies to determine the feasibility of using ET within a new weapon system. The decision aid in the form of an algorithm would be used to identify tentative applications for ET, and to clearly eliminate the further consideration of ET in other instances. The state-of-the-art in assessing ET requirements, and ET design feasibility has advanced to the point that mission and hardware constraint data can be used very early in weapon design and ITS design. Additional work, building upon the conceptual framework and original procedures presented by Strassel et al (1988) and Roth (1988), as well as the approach addressed here, is required before a fully functioning decision aid will be available. This includes defining the detailed decision algorithm, creating the decision aid implementing the algorithm, testing it in the design of notional and baseline ITS projects, revising the decision aid as required, and documenting the working decision aid.

Appendix A
Interviews and Trips

Appendix A
Interviews and Trips

• Ron Hofer	Chief, Operations Research Systems Eng. Division	Policies for & Training Device Development
Don Peckham	Technology Mgt Branch	Concept Formulation and Embedded Training
Gary Newman Gene Wiehagen	Engineering Concepts Branch	Procedures for Concept Formulation
Russell Lemanski	Engineering Concepts Branch	LHX Concept Formulation Study
Betsy Leon	Engineering Development Branch	Procedures for Concept Formulation
Bill Goodrick	Engineering Development Branch	Procedure Documentation
Ralph Nelson	Chief, Program Management and Requirements	Manages Concept Formulation Documentation and Funding

• ARMY AVIATION SYSTEMS COMMAND, ST. LOUIS

Ed Laughlin	Director, Systems and Cost Analysis	Cost Modeling
Maryann Trittschuh	PM/Training - LHX	Planning Training Procurement
Bob Hudson	Deputy PM - AH-64	Equipment and Training Procurement
Craig Breder	Logistician, PEO	Training Policy at PEO level

Ed Priddy	Director, Maintenance New Equipment Training Branch	QQPRI and Traditional Training Development
Thomas Metzler	ARI Representative	Training Effectiveness Measures

- TRADOC HEADQUARTERS, FT. MONROE

William Shepherd	Director, Strategy and Plans	Status of Blueprint of the Battlefield
Leslie Gibbings	Dynamics Research Corp.	Dev of Blueprint of the Battlefield

- TRADOC, FT.EUSTIS

Bill Mazeo	Chief, Unit Training Tansportation School	Use of Division Blueprint of Battlefield in ARTEP Development

- TRADOC, FT. RUCKER

TRAINING DEVELOPERS

LTC Cupples	Chief, New Systems Training and Simulator ACQ Branch	TRADOC Functions in Developing Training Systems for New Equipment
Willie Carn	New Systems Training Branch	STRAP and LHX Training Plans
James Dees	Chief, Aviation System Training Research Branch	Studies of Cost and Effectiveness of Alternative Training Designs

Bill Snider	Individual and Unit Training Branch	Support of Individual and Unit Training
Bill Pate	Aviation Simulation Material Devleopment	Host and Overall ITS Development

- TRADOC, FT. RUCKER

COMBAT DEVELOPERS

Charles Torrence	Concept Branch	Concept Based Requirements System
Gene Easterling	Material Integration Branch	O&O Plans

- ARMY TRAINING SUPPORT CENTER, FT. EUSTIS

TRAINING SUPPORT MANAGEMENT OFFICE

Larry Matthews	Training Data
Tom Boor	Training Data
Maria Sautillion	Training Data

- TRAINING PERFORMANCE AND DATA CENTER, ORLANDO, FL

Al Boudreaux	ITS Work Breakdown Structure

Appendix B

Bibliography

Regulations and Publications

Appendix B
Bibliography

Regulations and Publications

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Appendix C

References

Appendix C
References

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Appendix D

IDEFo Diagrams Depicting the Army Training System Design Architecture

Appendix D
IDEFo Diagrams Depicting the Army Training System Design Architecture

This appendix contains 199 IDEFo diagrams and accompanying narrative for each diagram. The diagrams and narratives depict the Army's process for designing Integrated Training Systems (ITS) for major new weapon systems.

Organizational information is provided to assist the reader in locating diagrams of interest and in understanding the relationships among the diagrams. Location of diagrams is facilitated by using the table of contents which follows this introduction. This table of contents identifies each diagram by node number, title, and page number. Following the table of contents is a visual table of contents (VTOC). The VTOC is composed of four figures, each corresponding to one of the four major portions of the systems engineering analysis (i.e., Notional Training System Design, Baseline Training System Design, Actual Training System Design, and Implementation of Training System Design). The VTOCs visually display the hierarchical relationships among the diagrams.

Following the VTOCs are the IDEFo diagrams. Each diagram is followed on the facing page by a narrative describing that node. Drawing conventions for the IDEFo diagrams generally follow standard practices as described in Marca and McGowan (1988). Three conventions have been added:

- An asterisk in the node box in the lower left portion of the diagram indicates that the diagram contains an innovation to the present ITS design practices.

- An asterisk in the activity boxes in a diagram indicates that the TRASER analyst chose not to further break out that branch of the analysis, either because the analysis had reached its logical lowest level or the further analysis did not involve training design processes.

- Mechanisms that apply to all activities under a node are indicated only at the highest level, thus simplifying the lower level diagrams.

Table of Contents for IDEFo Diagrams

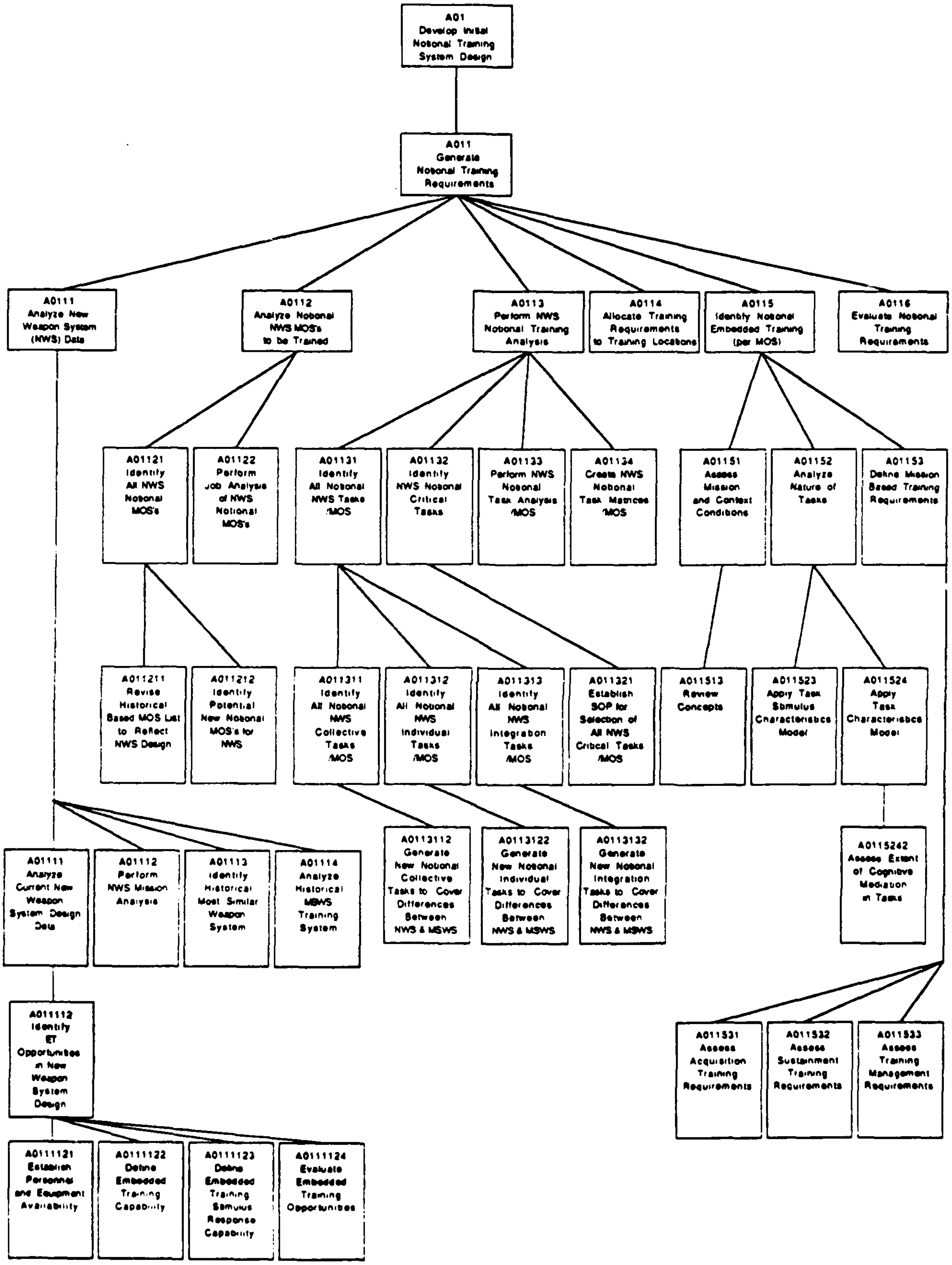

Figure D-1. VTOC for initial notional training system design analysis

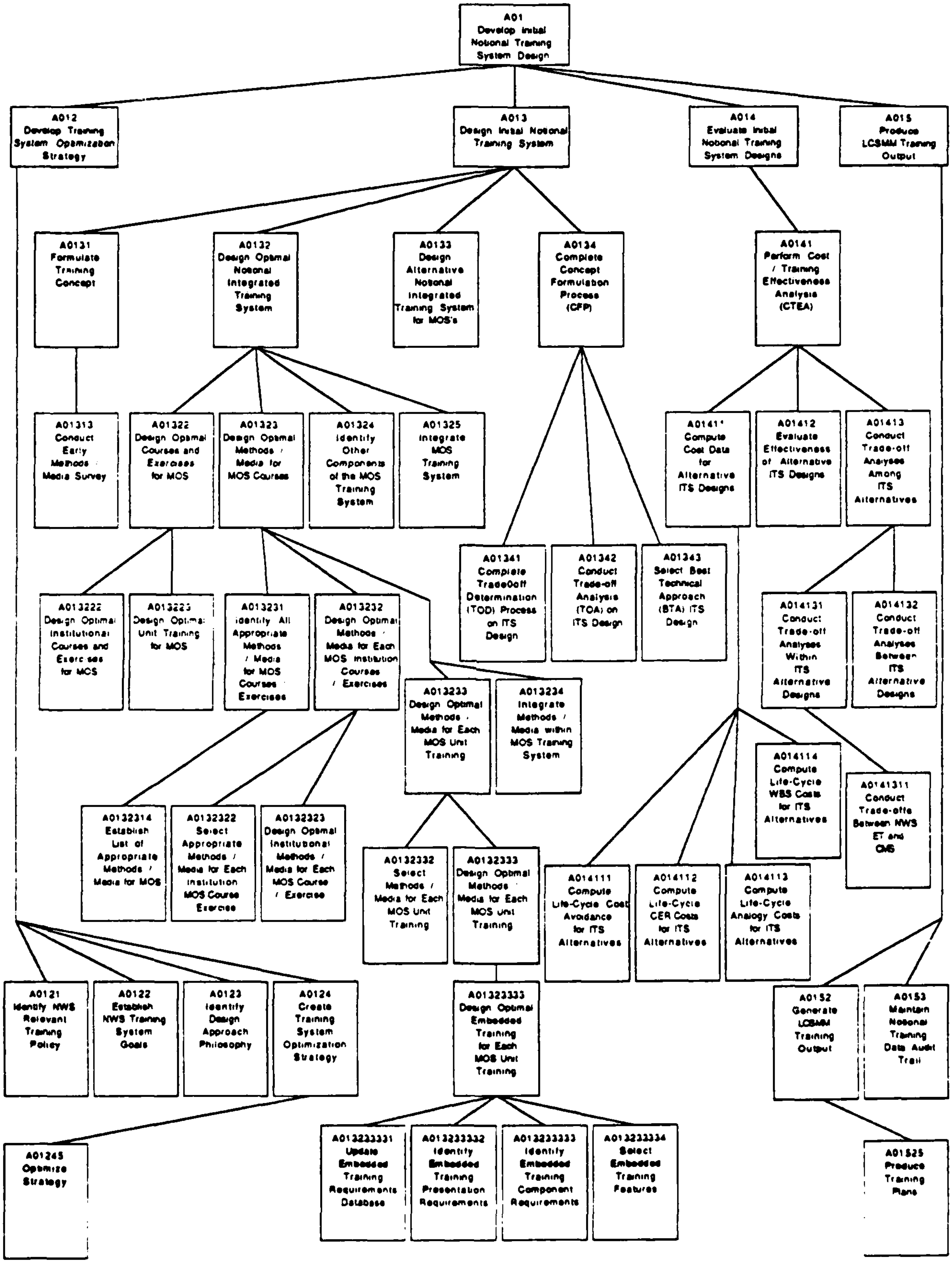

Figure D-1. VTOC for initial notional training system design analysis, continued

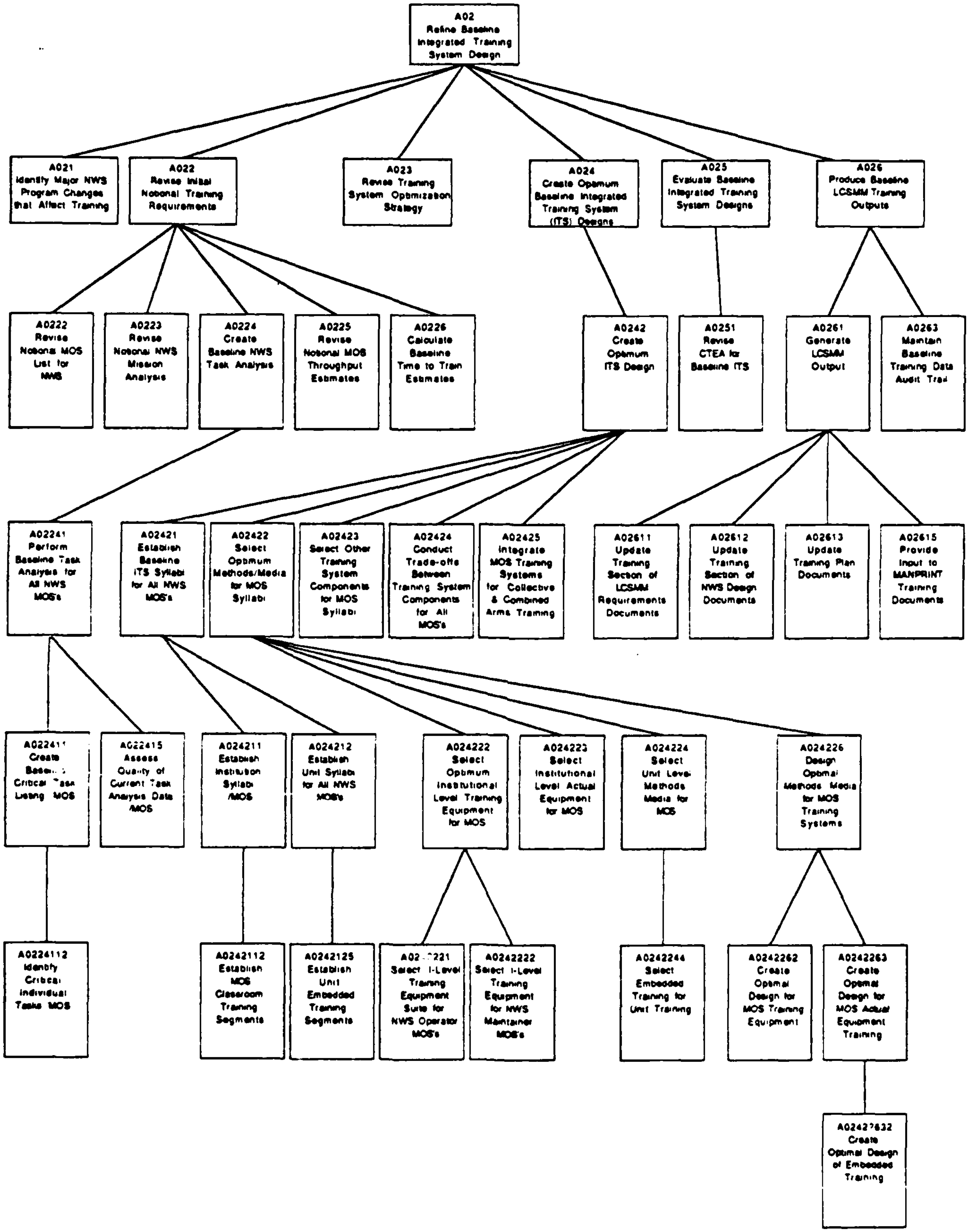

Figure D-2. VTOC for baseline training system design analysis

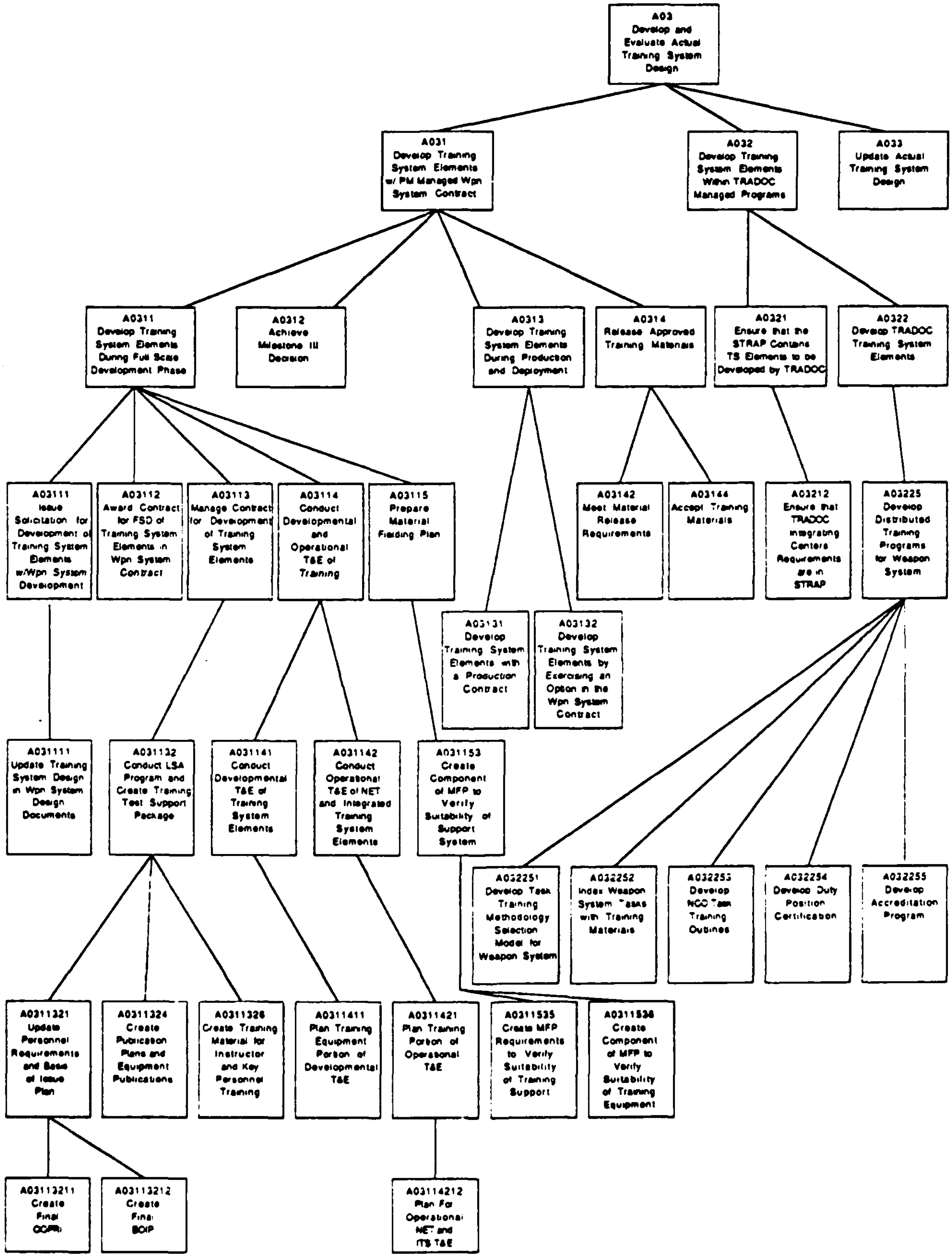

Figure D-3. VTOC for actual training system design analysis

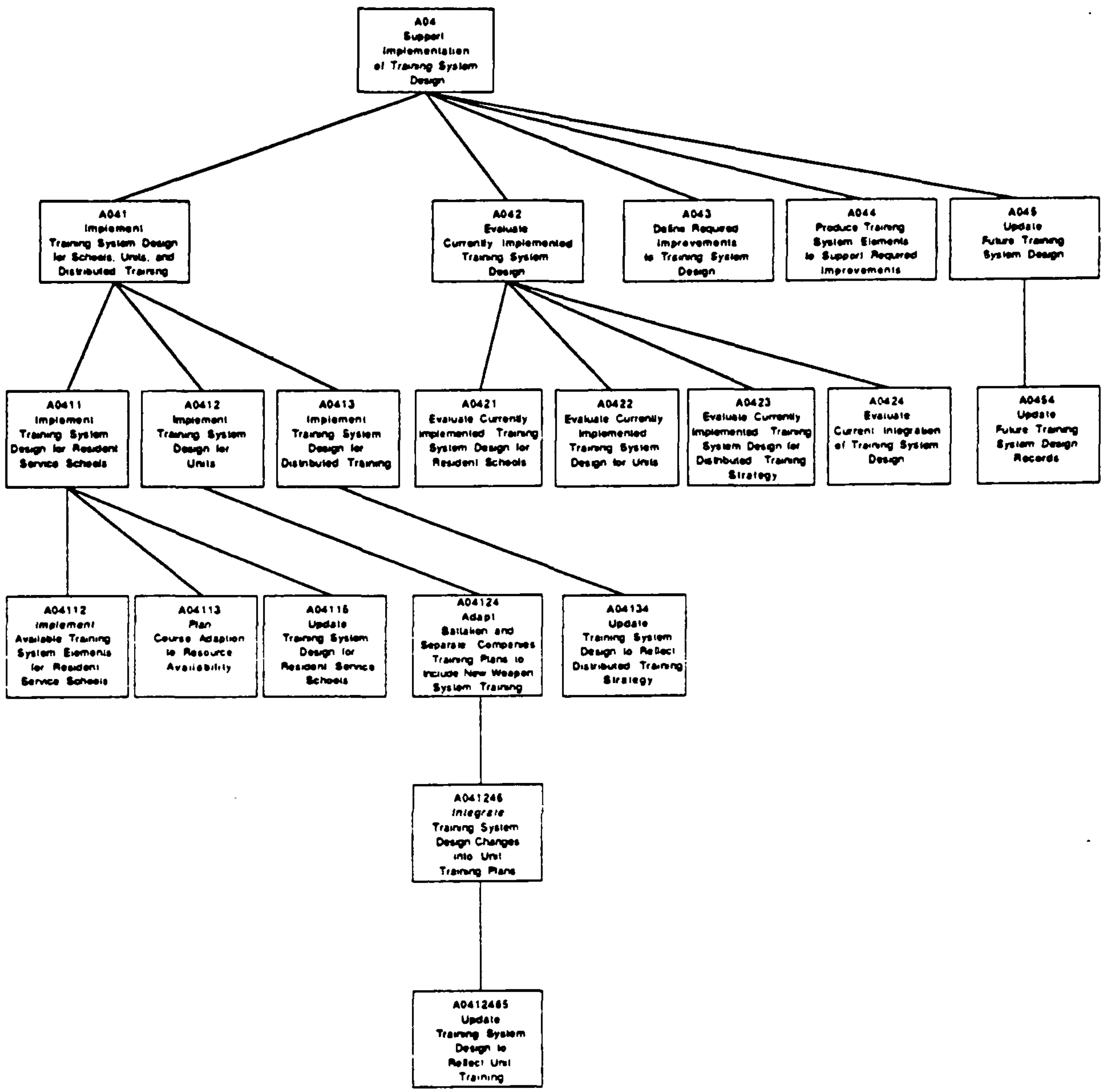

Figure D-4. VTOC for fielded training system design analysis

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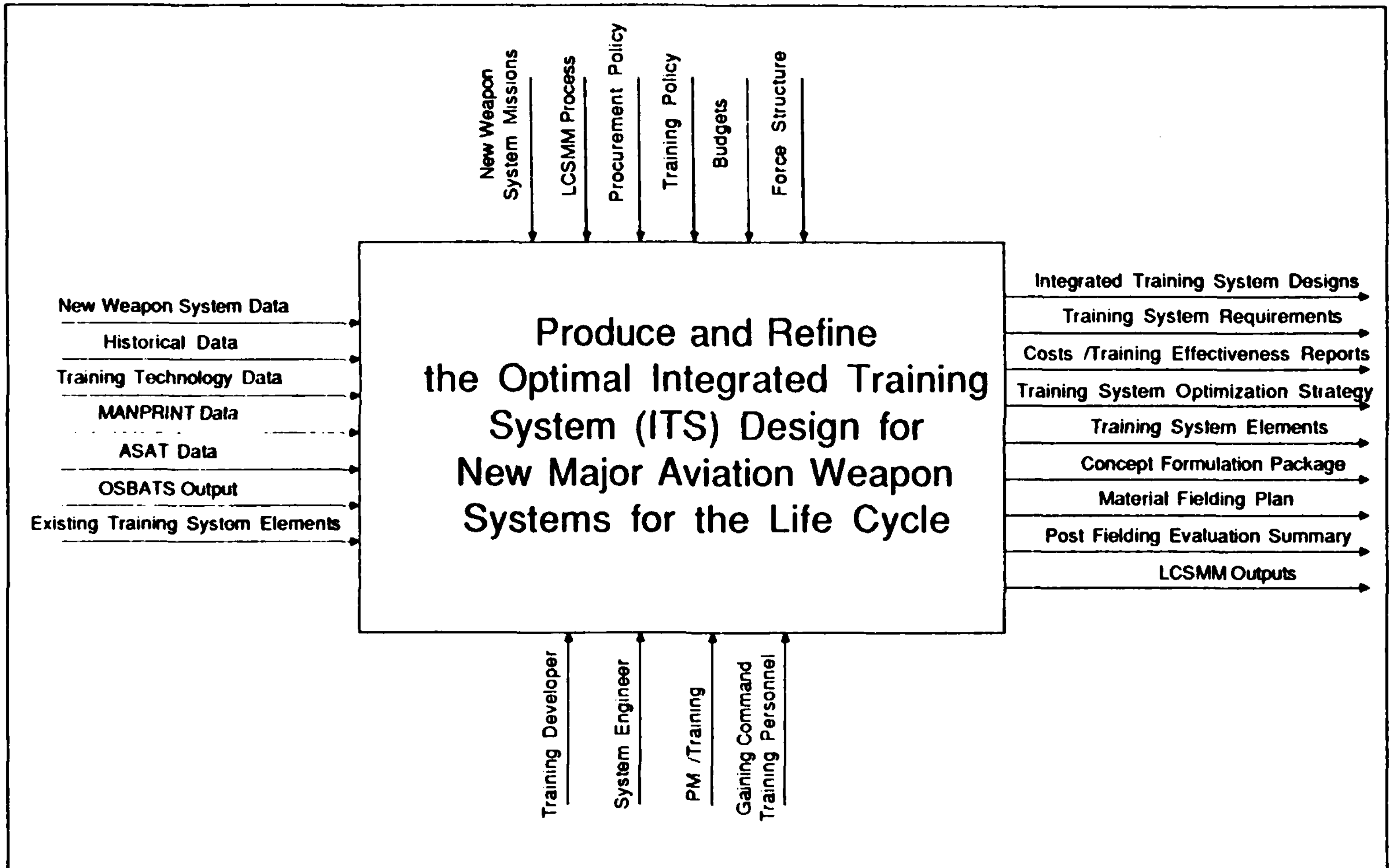

NODE: TRASER A-0	TITLE: Produce and Refine Optimal Integrated Training System Design	NUMBER:

TRASER A-0 PRODUCE AND REFINE THE OPTIMAL INTEGRATED TRAINING SYSTEM (ITS) DESIGN FOR MAJOR AVIATION WEAPON SYSTEMS FOR THE LIFE CYCLE

This is the top-level IDEFo diagram for TRASER. As shown, the goal of the TRASER system is to produce, refine, and support an optimal training system design for the life cycle of the new, evolving aviation weapon system under the LCSMM process.

USED AT:	AUTHOR:	DATE: 1/15/90		WORKING	READER	DATE	CONTEXT:
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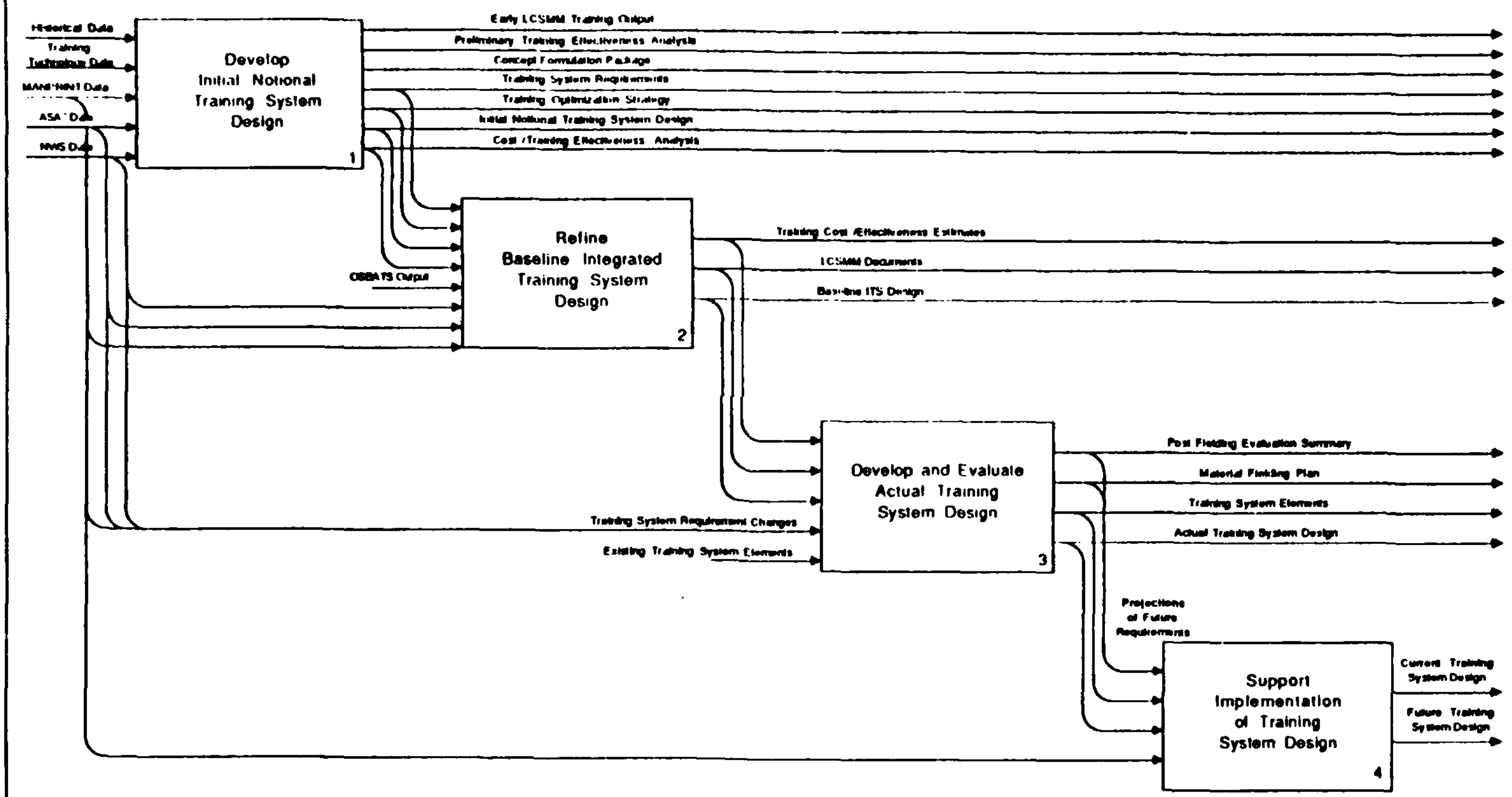

NODE:	TITLE:	NUMBER:
TRASER A0	Produce and Refine the Integrated Training System Design	

TRASER A0 PRODUCE AND REFINE THE INTEGRATED TRAINING SYSTEM DESIGN

This diagram describes four major activities involved in defining and refining the training system design. The activities include developing the initial notional training system design, refining the notional training system design, developing and evaluating the actual training system design, and supporting the training system design. These four activities correspond to the major divisions in the LCSMM process. The first corresponds to the Concept Exploration Phase which lasts from Milestone 0 to Milestone I. The next corresponds to the Demonstration and Validation Phase which is bounded by Milestone I and Milestone II. The third corresponds to the Full Scale Development Phase which spans the Milestone II to Milestone III era. The last concerns support of the training system design after IOC. It should be noted that due to the difficulty of representing the large number of constraints on the limited space on this diagram, the constraints and mechanisms are not drawn. Please refer to diagrams A01, develop initial National Training System Design; A02, Refine Baseline Integrated Training System Design; A03, Develop and Evaluate Actual Training System Design; A04, Support Implementation of Training System Design, for the applicable representation.

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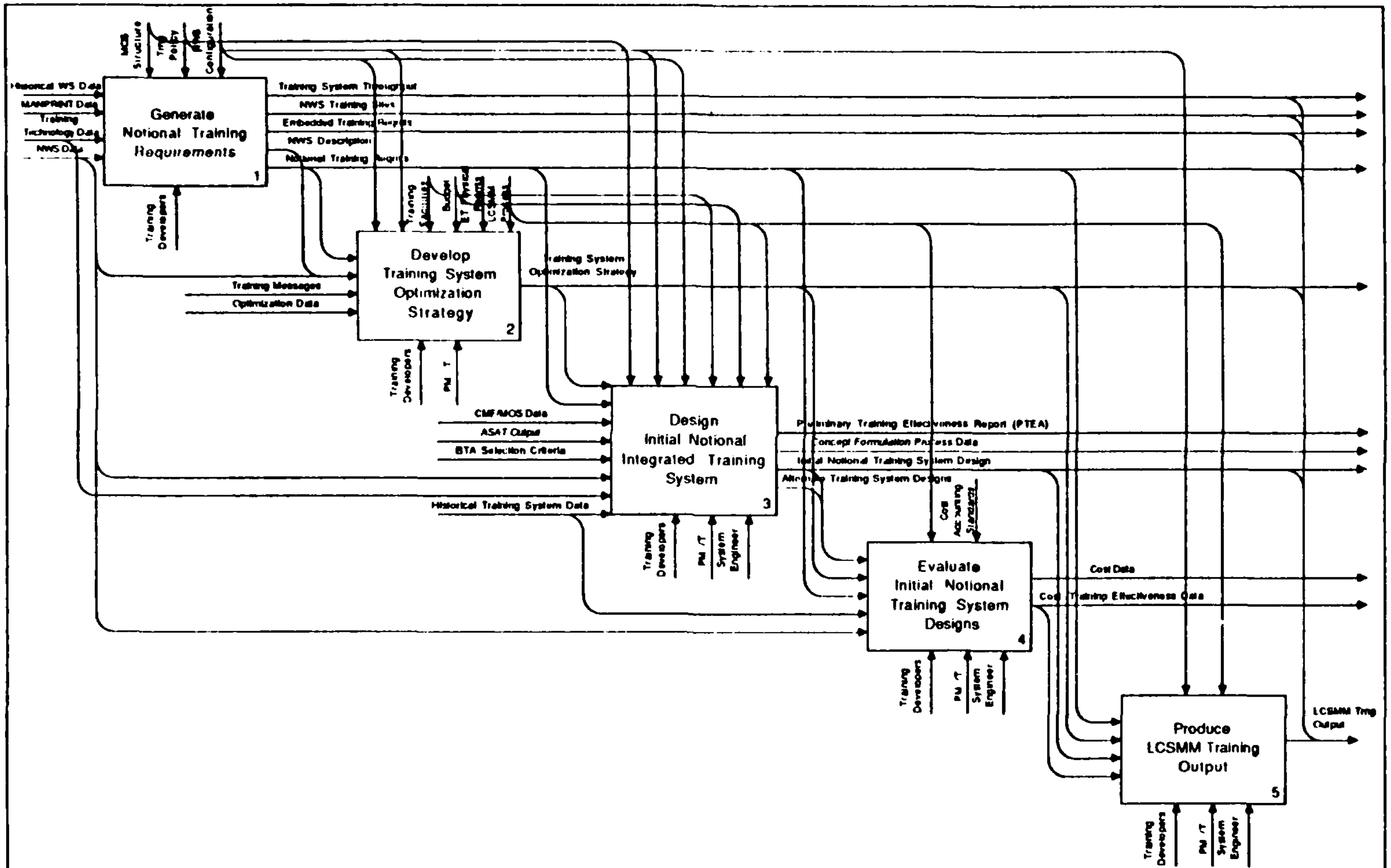

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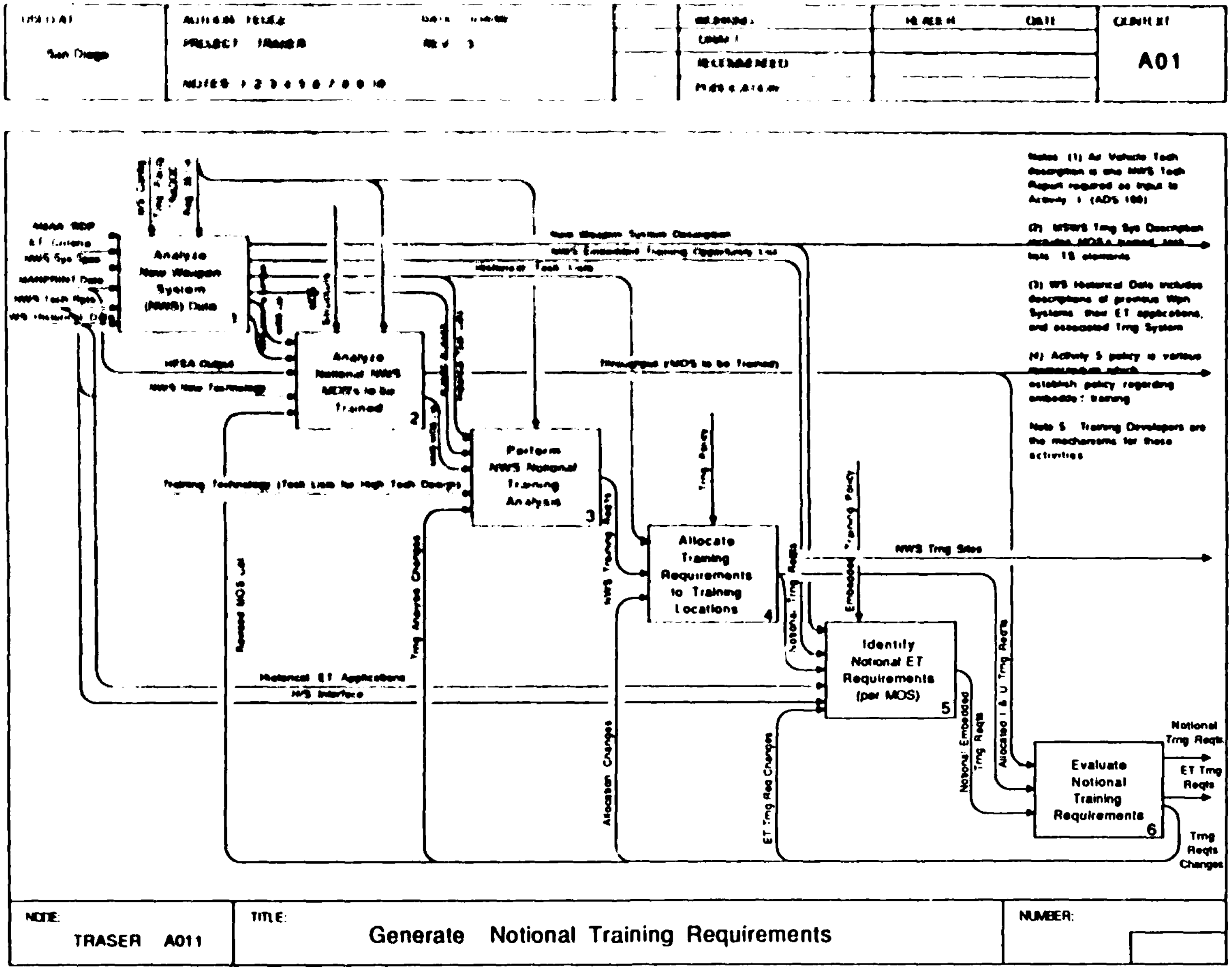
TRASER A01 DEVELOP INITIAL NOTIONAL TRAINING SYSTEM DESIGN

This activity of the TRASER architecture is intended to address the AMAA-stated deficiency of late delivery of Army training systems. This activity is to be initiated at or shortly after Milestone 0. The purpose of this activity is to develop a "strawman" or notional concept for the training system as early as possible so that training developers will have sufficient time and basis from which to explore alternatives, plan for LCSMM training outputs, provide well thought out budgetary estimates early in weapon system development, and generally maintain concurrent development with the evolving weapon system. To develop the early training system concept, the training developer will have to develop notional training requirements, a training optimization strategy, design the training system, evaluate the training system design, and produce LCSMM outputs required between Milestone 0 and Milestone 1.


San Diego
PROJECT TRASER
REV 3
NOTES 1 2 3 4 5 6 7 8 9 10
CONTEXT
A01
Analyze New Weapon System (NWS) Data
1
Analyze Notional NWS MOS's to be Trained
2
Perform NWS Notional Training Analysis
3
Allocate Training Requirements to Training Locations
4
Identify Notional ET Requirements (per MOS)
5
Evaluate Notional Training Requirements
6
New Weapon System Description
NWS Embedded Training Opportunity List
Historical Tech Lists
HFEA Output
NWS New Technology
Throughput (MOS to be Trained)
Training Technology (Tech Lists for High Tech Designs)
Revised MOS List
Trng Analysis Changes
Historical ET Applications
NWS Interface
NWS Training Reqts
Trng Policy
Allocation Changes
Notional Trng Reqts
Embedded Training Policy
NWS Trng Sites
ET Trng Req Changes
Notional Embedded Trng Reqts
Allocated I & U Trng Reqts
Notional Trng Reqts
ET Trng Reqts
Trng Reqts Changes
Notes (1) Air Vehicle Tech Description is one NWS Tech Report required as input to Activity 1 (ADS 100)
(2) NWS Trng Sys Description includes MOS's trained, task lists, 15 elements
(3) WS Historical Data includes descriptions of previous Wpn Systems, their ET applications, and associated Trng System
(4) Activity 5 policy is various mechanisms which establish policy regarding embedded training
Note 5 Training Developers are the mechanisms for these activities
NODE:
TRASER A011
TITLE:
Generate Notional Training Requirements
NUMBER:

TRASER A011 GENERATE NOTIONAL TRAINING REQUIREMENTS

This activity of the architecture is intended to establish the scope of what the training system must accomplish, as a preliminary to the actual design effort. In this activity, new weapon system data, at whatever level of detail available, are analyzed to determine which MOS's will be trained, which tasks they will be trained for, how many students per MOS will be trained, where the various NWS tasks will be trained, whether embedded training will be part of the new weapon system (NWS) design, and whether the training requirements are complete and valid. Collectively, these data comprise the NWS training requirement that the new training system must meet to be successful.

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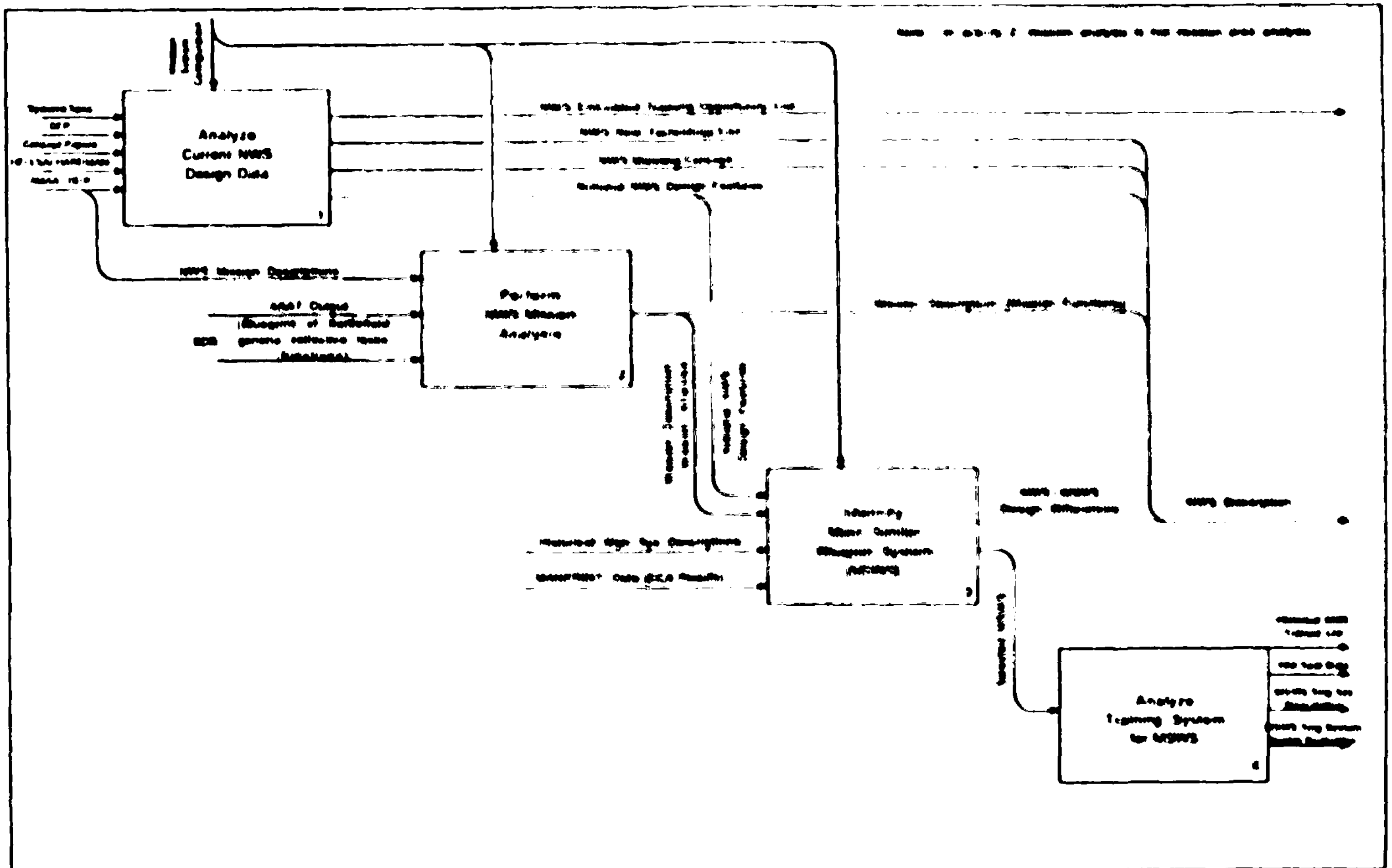
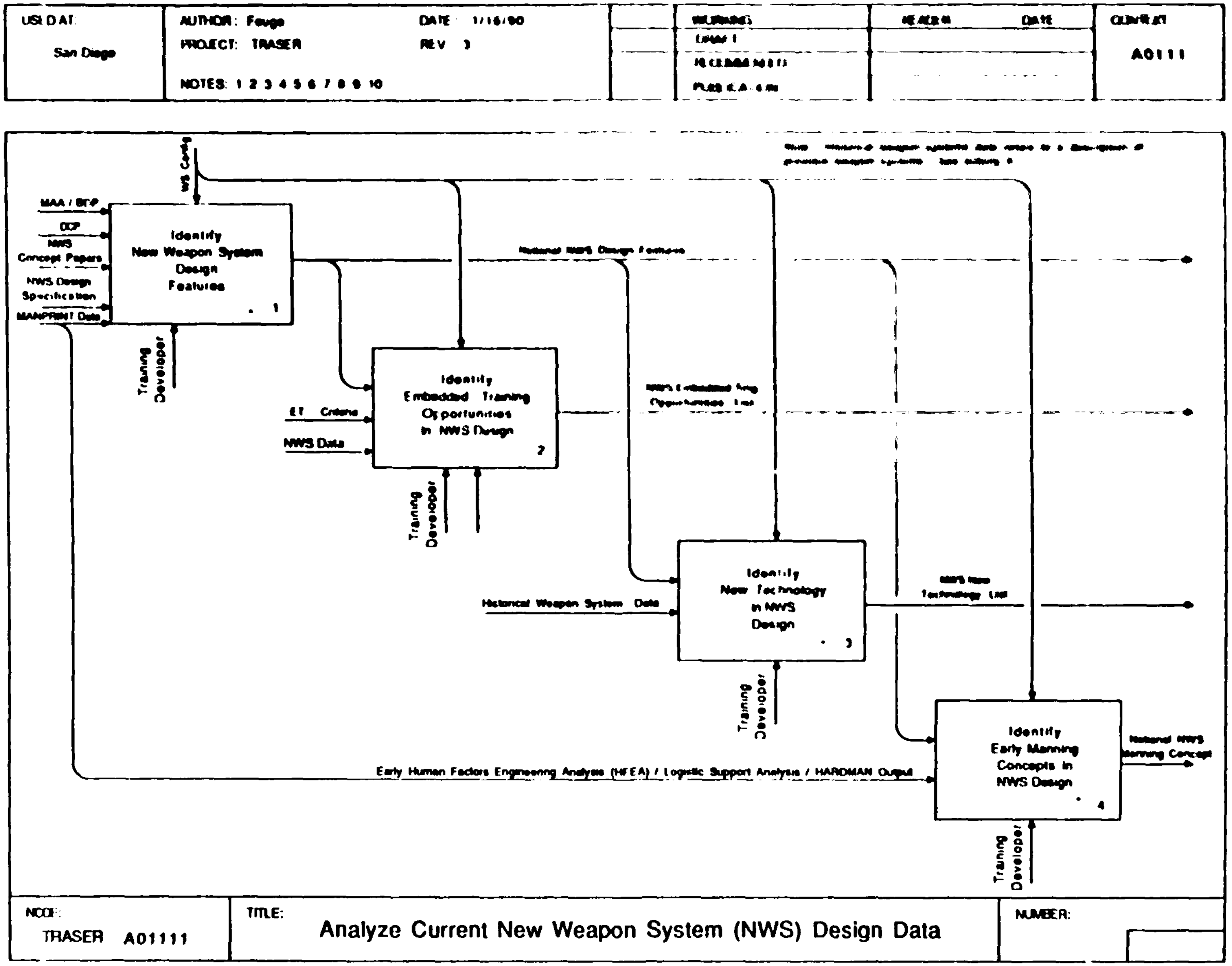


NODE	TITLE	NUMBER
TRASER A0111	Analyze New Weapon System (NWS) Data	

TRASER A0111 ANALYZE NEW WEAPON SYSTEM (NWS) DATA

This activity is intended to describe the types of analyses that the training developer will have to perform to obtain the data necessary to develop complete and valid training requirements, as well as other related data needed in the design effort. As part of this activity, the current NWS design must be continually analyzed to determine the impact on training system features, particularly the mission simulators and embedded training (ET). In addition, the NWS mission must be analyzed and tracked because of its relationship to MOS tasks. To obtain historical data (which is vital at this very early stage of WS development), the previous most similar weapon system must be determined in order to analyze its training system and associated data.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AUTHOR: Fauge
PROJECT: TRASER
DATE: 1/16/90
REV: 3
NOTES: 1 2 3 4 5 6 7 8 9 10
DATE
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A0111
MAA / BCP
DCP
NWS Concept Papers
NWS Design Specification
MANPRINT Data
WS Config
Identify New Weapon System Design Features 1
Training Developer
Identify Embedded Training Opportunities in NWS Design 2
ET Criteria
NWS Data
Identify New Technology in NWS Design 3
Historical Weapon System Data
Identify Early Manning Concepts in NWS Design 4
Early Human Factors Engineering Analysis (HFEA) / Logistic Support Analysis / HARDMAN Output
NODE:
TRASER A01111
TITLE:
Analyze Current New Weapon System (NWS) Design Data
NUMBER:

TRASER A01111 ANALYZE CURRENT NEW WEAPON SYSTEM (NWS) DESIGN DATA

This activity deals specifically with NWS design data and its impact on the training system design. The training developer must identify the current design features as accurately as the data will allow in the Conceptual Exploration Phase. Also, the NWS design must be reviewed to establish whether the minimum design features necessary to apply embedded training exist in the NWS design. The NWS design is reviewed to identify any new technology that exists in the NWS design. This new technology, if radical enough, may require the postulation of a notional new MOS (see A01114 and A0112). Finally, early concepts for manning must be identified to determine crew training requirements that may differ from the historical most similar weapon system (MSWS) training system MOS list.

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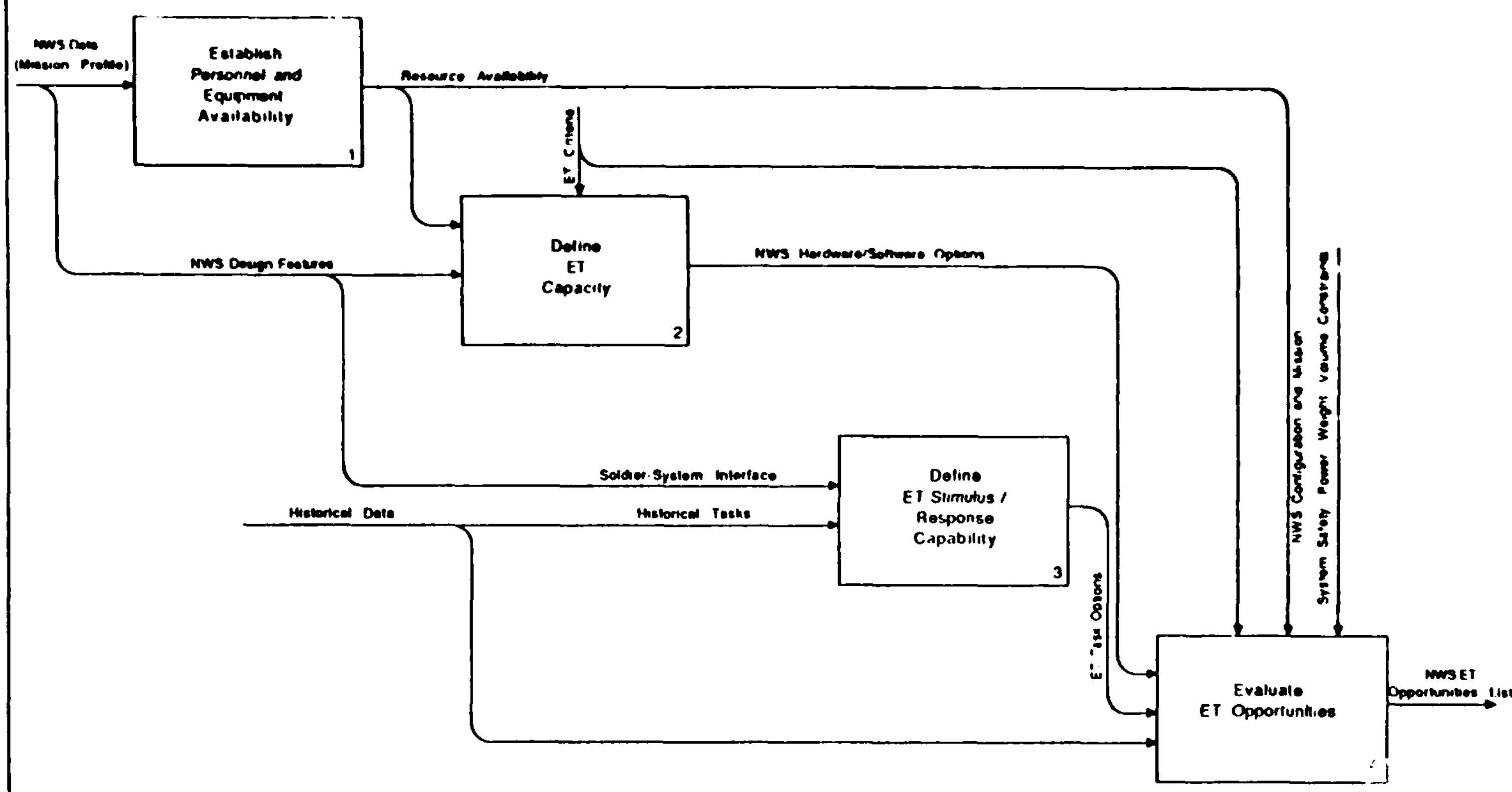

NODE: TRASER A011112	TITLE: Identify Embedded Training Opportunities in New Weapon System Design	NUMBER:

TRASER A011112 IDENTIFY EMBEDDED TRAINING IN NEW WEAPONS SYSTEM DESIGN

This activity results in the development of a minimum features set to support ET on the new weapon system based on existing design features, expected weapons system mission profiles, and soldier tasks on historical systems. Essentially, the activity defines the opportunities for ET on the NWS. The training developer must analyze projected personnel and equipment to determine availability for ET use. Then the training developer must apply criteria for ET against the constraints imposed by the NWS design feature set to estimate the options for ET on the prime system itself. Established ET criteria include Army policies which specify the scope of ET application, and stated system safety or health hazard guidelines which must be accommodated by the ET subsystem of the NWS. Other criteria establish the basic hardware and software characteristics which should exist to support various approaches to ET. The soldier system interface (SSI) of the NWS and known soldier tasks on historical systems are used to estimate the capacity of the system interface to supply and trap the necessary training stimuli and responses. These options and constraints are combined to produce a profile of ET opportunities which will later be compared against ET requirements to develop ET concepts. Since changes in any of the input conditions such as the nature of the SSI, or the capacity of the prime system, would change the hardware capability to support ET, this step should be revisited often, based on the nature of the design decisions.

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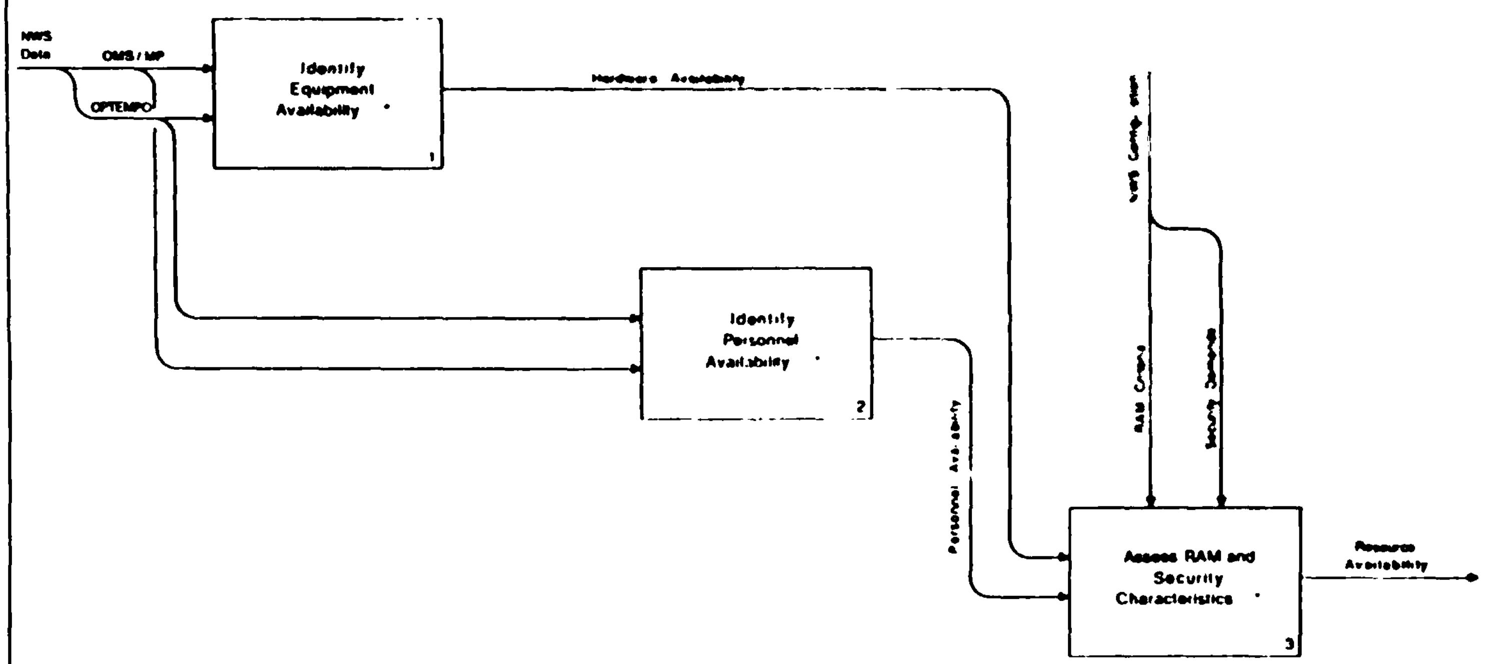

NODE:	TITLE:	NUMBER:
TRASER A0111121	Establish Personnel and Equipment Availability	

TRASER A0111121 ESTABLISH PERSONNEL AND EQUIPMENT AVAILABILITY

By considering Operational Mode Summary/Mission Profile (OMS/MP), Operational TEMPO (OPTEMPO), and logistics data, this activity estimates the availability of the NWS to serve as a training device during peacetime, mobilization, and war. The training developer must consider the characteristics of the missions and units in which the system will fight to determine the profiles of system and personnel utilization. Systems which preclude training software or data from sharing the operational software due to security issues, or are committed for round-the-clock combat readiness during peacetime and war, may be limited in their application of ET to rehearsal exercises, while systems which have free time available in the garrison would be accessible for a full range of sustainment as well as acquisition training. Similarly, high RAM demands, and operational classification or security restrictions will be applied as controls to assess overall resource availability.

USED AT	AUTHOR Evans	DATE 1/12/90		WORKING	READER	DATE	CONTEXT:
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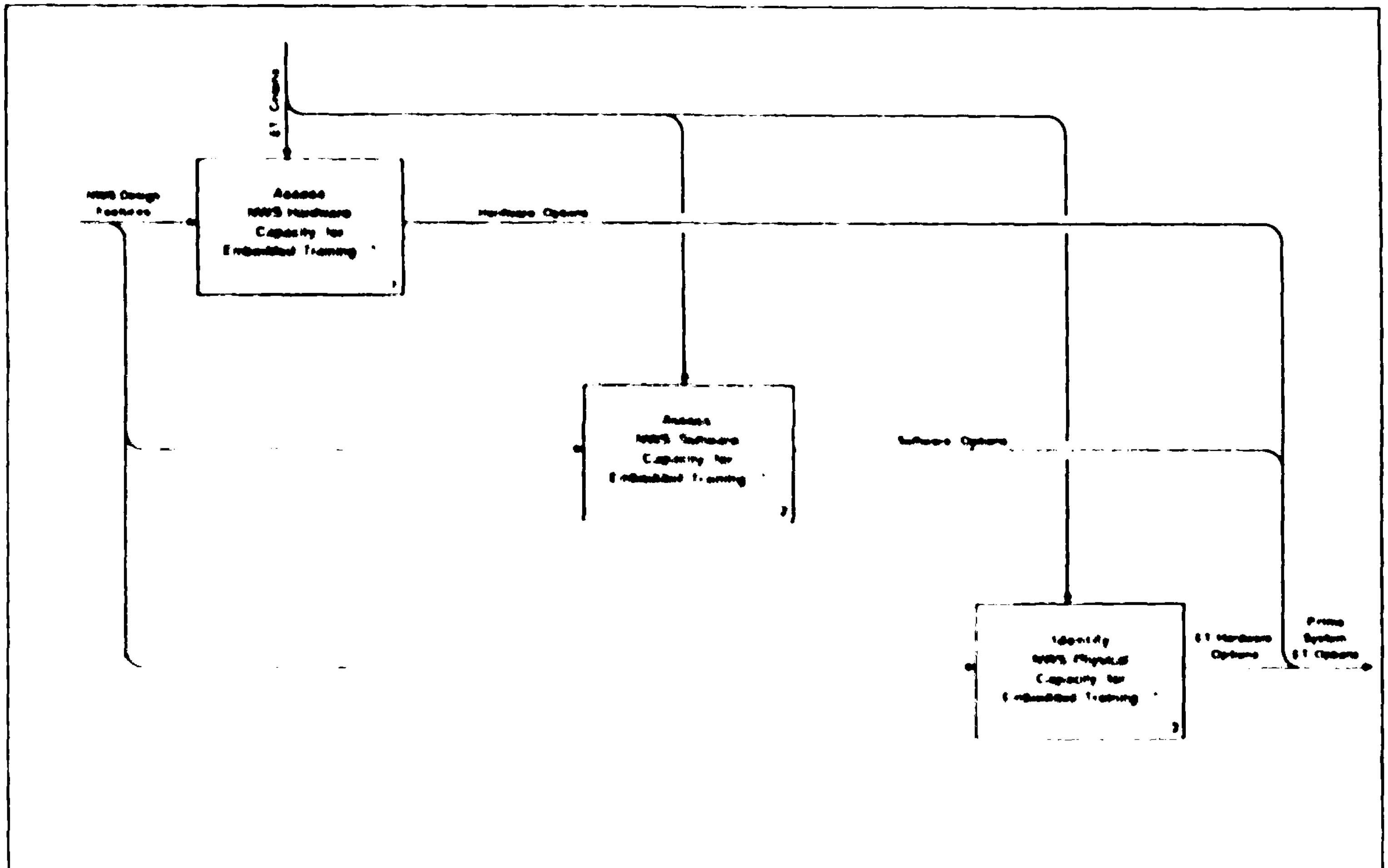

NODE	TITLE	NUMBER
TRASER A0111122	Define Embedded Training Capacity	

TRASER A0111122 DEFINE EMBEDDED TRAINING CAPACITY

Activities within this activity identify and assess the characteristics of the hardware, software, and physical dimensions of the new weapon system to support ET. The nature of the NWS central electronics bus architecture is assessed, as well as current central processing unit (CPU), memory, and storage capacity. Electronics sensors, displays and control mechanisms, such as radar displays and electronic "drive-by-wire" versus mechanisms, which are fully integrated through a common electronics bus architecture are relatively easy to interrupt and artificially simulate for training purposes. Inadequate cpu power, memory and storage capacity preclude the implementation of on-line ET, unless these restrictions are eliminated through NWS design changes. NWS software issues such as the software architecture, and the nature of interfaces between operational software segments (e.g., fire control, target recognition, or console interrupts) which might limit ET opportunities are identified. In addition, dimensional constraints which would limit placement of any additional special-purpose ET equipment are evaluated to identify the bounds of the physical parameters for ET among the NWS hardware suite. Established and agreed-upon ET criteria, serving as controls, are used throughout the process to assess the prime system ET opportunities.

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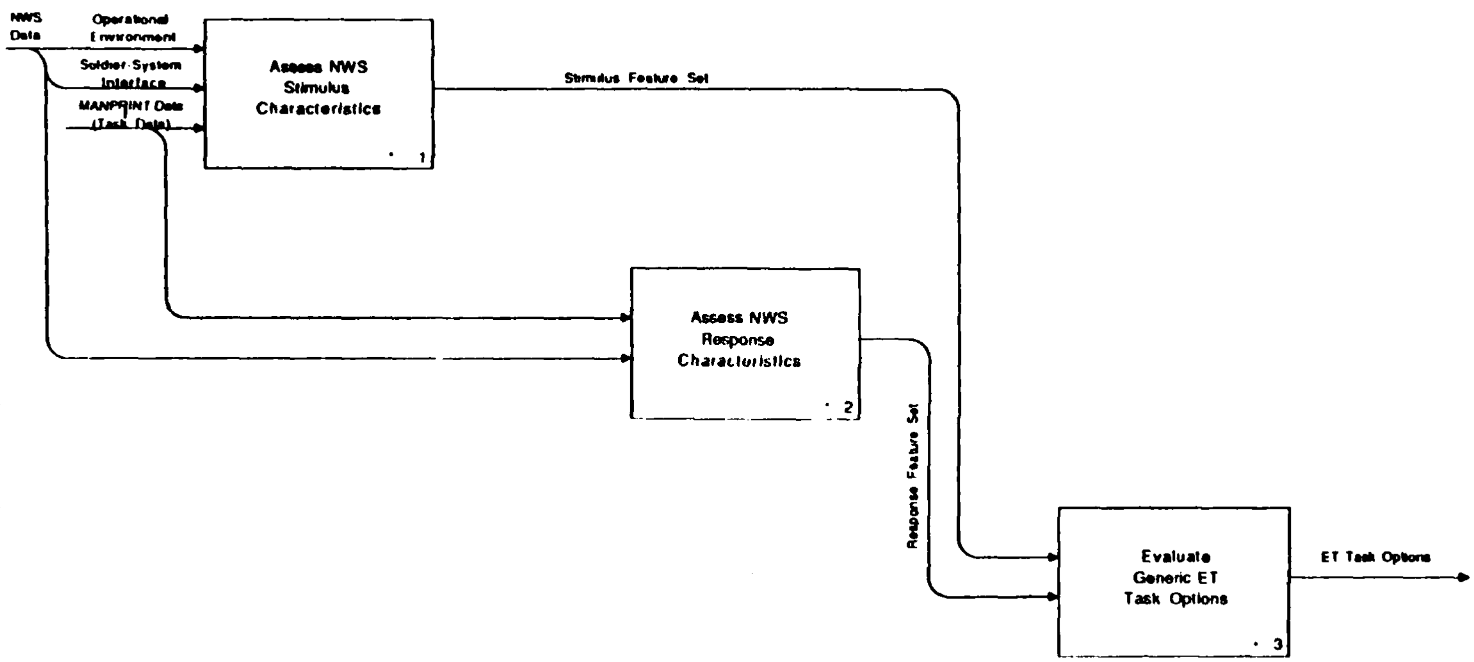

NODE:	TITLE:	NUMBER:
TRASER A0111123	Define Embedded Training Stimulus / Response Capability	

TRASER A0111123 DEFINE EMBEDDED TRAINING STIMULUS AND RESPONSE CAPABILITY

Characteristics of the NWS soldier-system interface (SSI), and the nature of the tasks to be performed using the system, are assessed in this activity to identify general areas of ET suitability. The presence of critical features of the NWS SSI, such as the nature of the stimuli appearing during peacetime, mobilization, or war, and system response mechanisms, are noted. For example, if most input is provided to a soldier through a video display, or if the soldier sees direct-view or optically related images of the visual environment outside the system, these are important characteristics of the way task stimuli are presented by the system. The way the operator controls the system is also important characteristic that should be considered. Operator tasks which result in actions directly involving the NWS electronics or softwarc through physical keystroke, control activation, or command selection, can be sensed and monitored in an ET scenario with relative ease as well. Conversely, if the result of an operator task is a decision or spoken language, it may be impossible for the ET software to sense the outcome. The nature of the human operator tasks, in terms of their complexity, and the use of cognitive, psychomotor, perceptual, or physical capabilities, also will be determined. The outcome of the activity is a set of general task types, independent of training requirements, which could be supported in ET by the current characteristics of the SSI.

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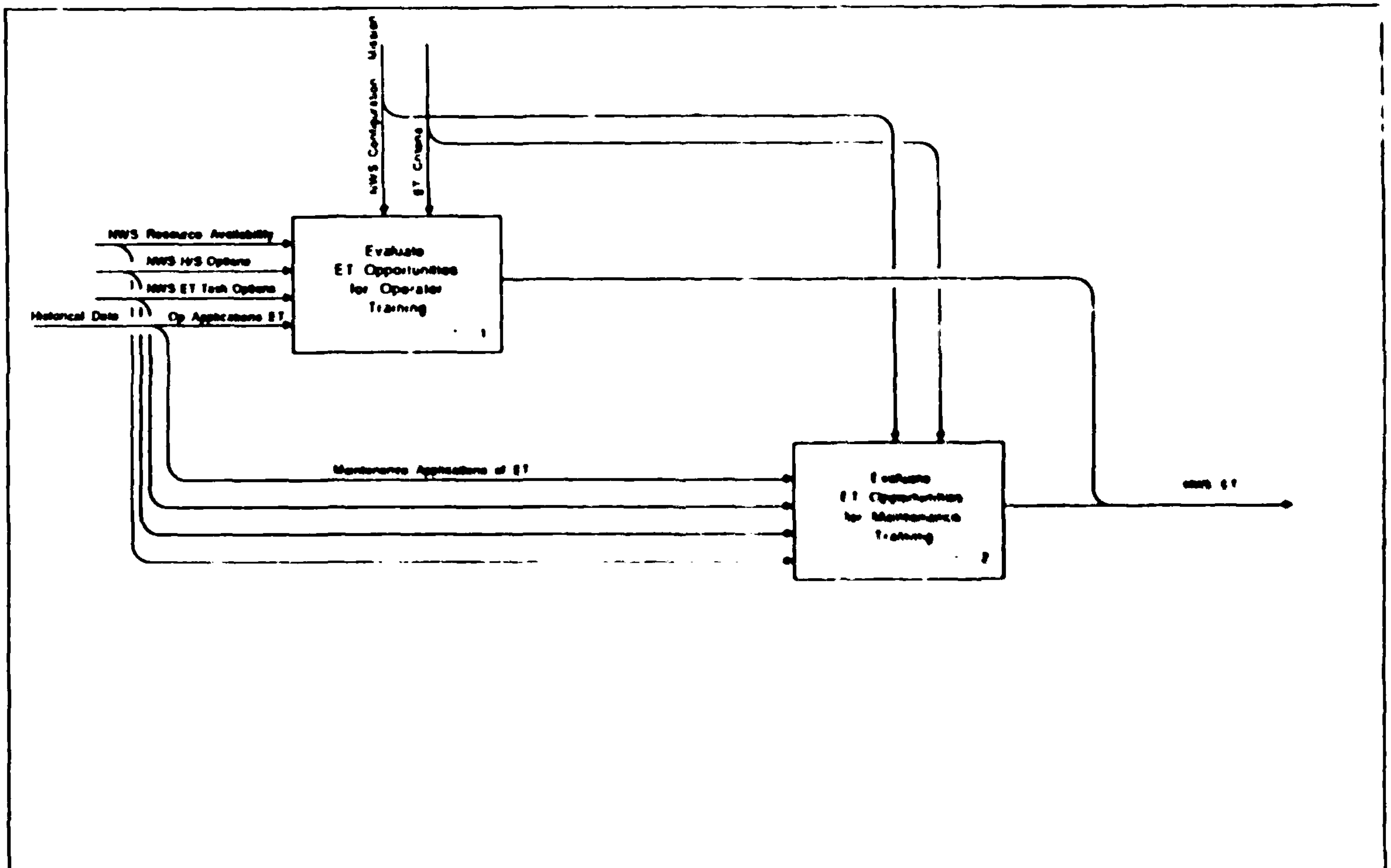

NODE:	TITLE:	NUMBER
TRASER A0111124	Evaluate Embedded Training Opportunities	

TRASER A0111124 EVALUATE EMBEDDED TRAINING OPPORTUNITIES

This final activity assembles the set of task and weapon system characteristics, as well as potential constraints imposed by personnel and equipment resource availability, system safety or space constraints, and ET criteria, to establish a profile of ET opportunities. The task and weapon system characteristics exist as a table of features which are present on the NWS and which could support some form of ET. Features apply to the hardware and software architecture, the SSI, and unit- or mission-dictated training opportunities. In the initial iteration through this process, the features may be identified as available or unavailable. Successive iterations should focus on detailing the features to aid in defining the actual form of feasible ET. This set will form a minimum feature set for ET based on the current weapon system configuration. Opportunities for operator and maintainer training are considered separately within the activity, although similar input feeds both.

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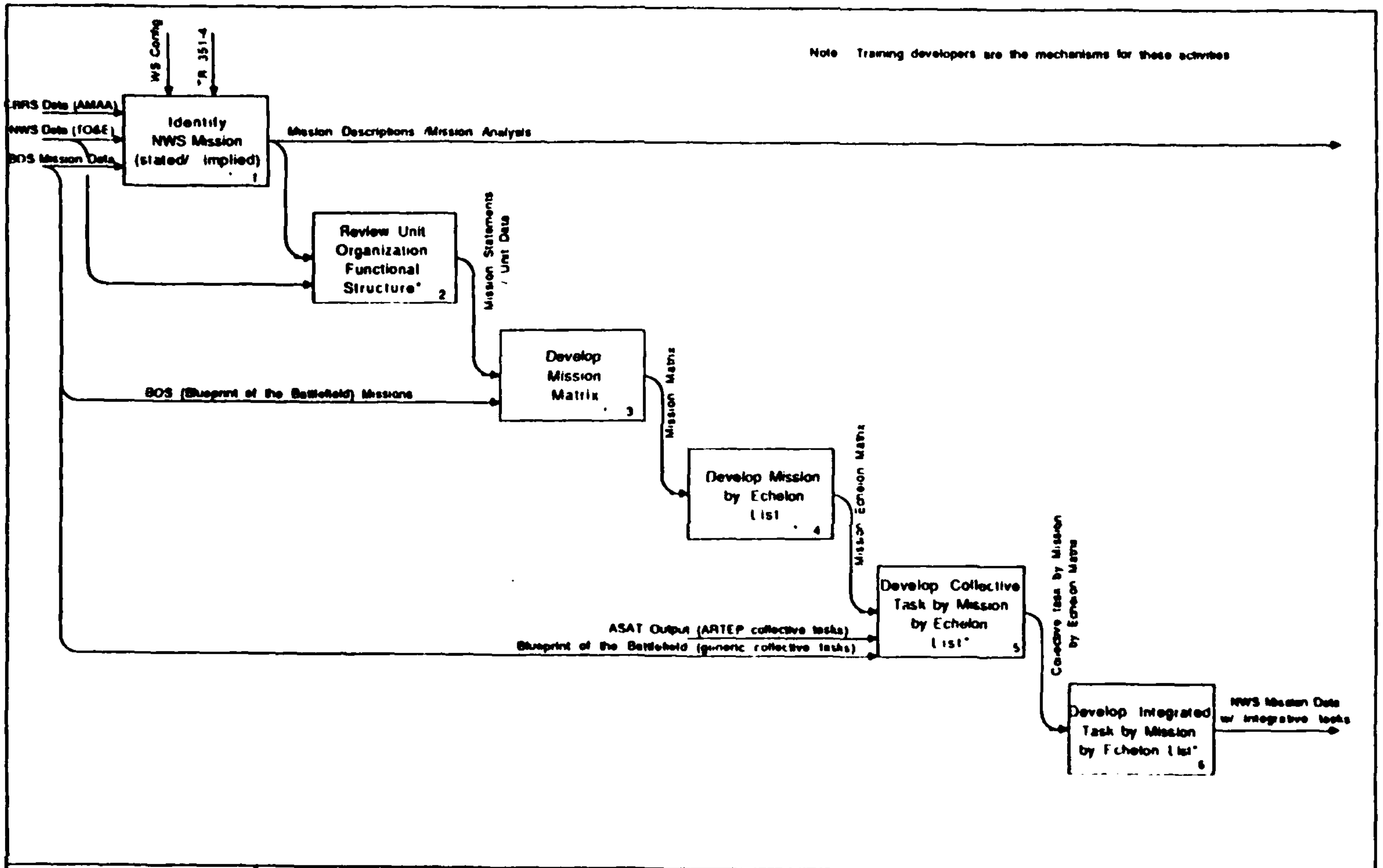

NODE:	TITLE:	NUMBER:
TRASER A01112	Perform NWS Mission Analysis	

TRASER A01112 PERFORM NEW WEAPON SYSTEM (NWS) MISSION ANALYSIS

In this activity, the training developer must perform a mission analysis on the new NWS mission. This step, according to TRADOC Pam 351-4, is required whenever new materiel is introduced into the Army. This step involves identification of all NWS missions, stated or implied. The training analysis, which follows the mission analysis, must be rooted in the mission statements in order to reflect the realities of the battlefield. As part of the mission analysis, various matrices are created which relate missions to various echelon lists. These matrices, or tables, are usually used for determining tasks and locations of task performance in the Army's force structure. Currently, these matrices are organized around Blueprint of the Battlefield functions and published in ARTEP and Drill Soldier Training Publications. It was assumed that a similar, tabular representation of missions and tasks will become an output of ASAT at some future time.

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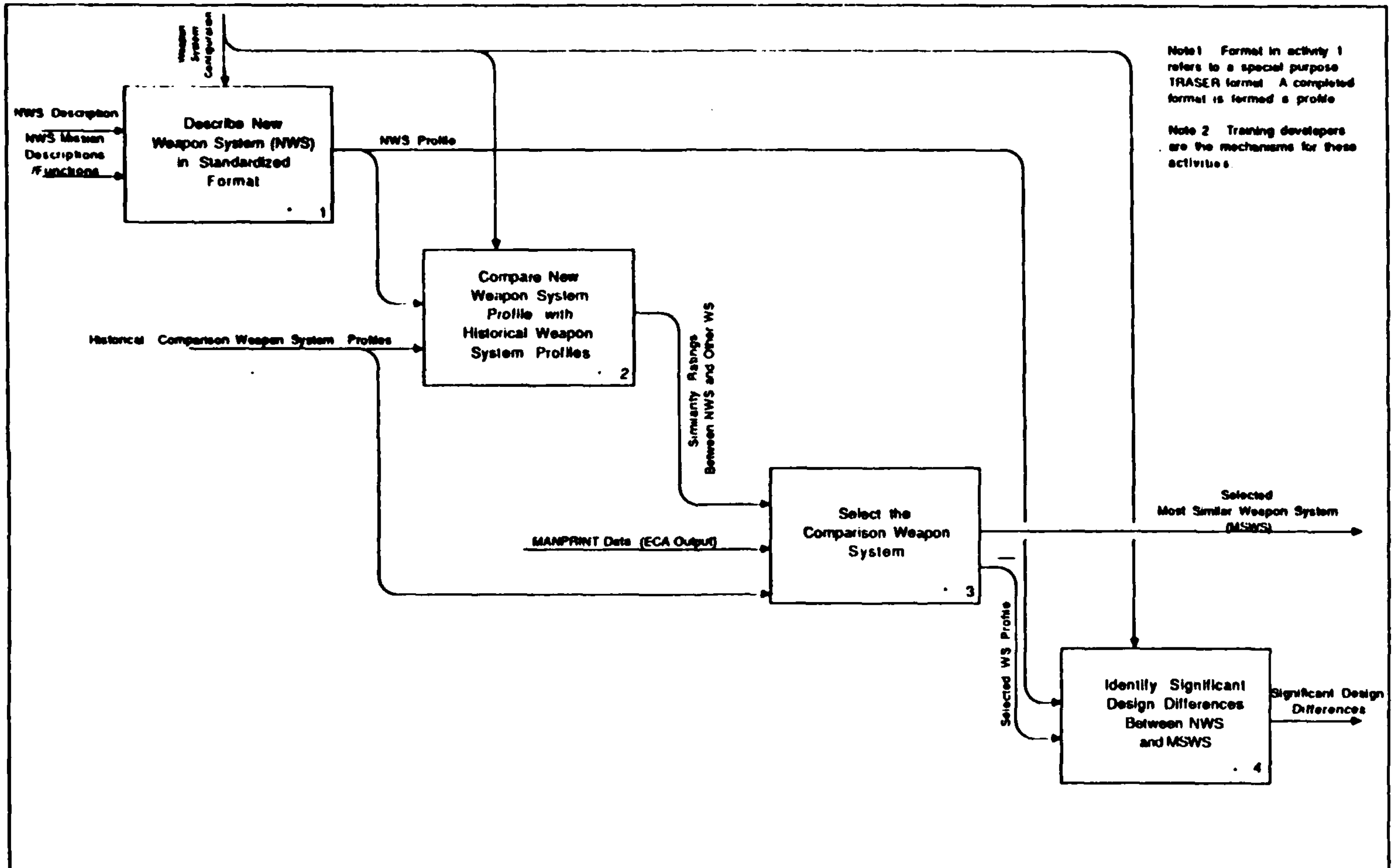
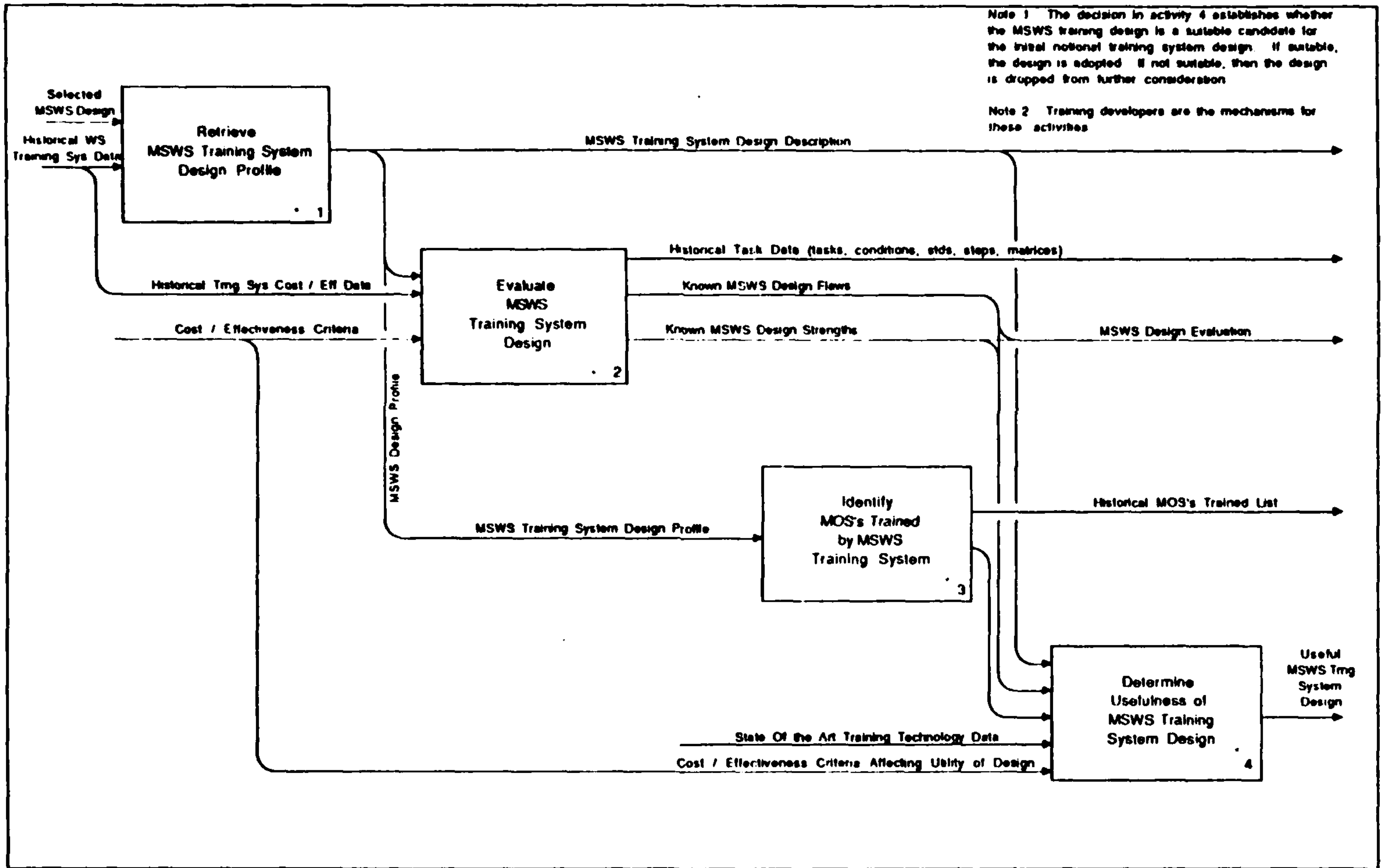


NODE:	TITLE:	NUMBER:
TRASER A01113	Identify Historical Most Similar Weapon System (MSWS)	

TRASER A01113 IDENTIFY HISTORICAL MOST SIMILAR WEAPON SYSTEM (MSWS)

In this activity, a comparison-based selection process is used to identify a previous weapon system that is similar in design and mission to the NWS. This process will require that the NWS design be placed into a standardized TRASER- specific format and compared with previous weapon systems stored in TRASER databases, also described in the same standard TRASER-specific format. Selection will performed automatically by TRASER. In addition, TRASER will flag significant design differences between the NWS and the MSWS designs for subsequent analysis.

USED AT: San Diego	AUTHOR: Feuge PROJECT: TRASER NOTES: 1 2 3 4 5 6 7 8 9 10	DATE: 1/16/90 REV: 1	WORKING DRAFT RECOMMENDED PUBLICATION	READER	DATE	CONTEXT: A0111



NODE: TRASER A01114	TITLE: Analyze Historical MSWS Training System	NUMBER:

TRASER A01114 ANALYZE HISTORICAL MSWS TRAINING SYSTEM

The purpose of this activity is to determine the nature and utility of the MSWS training system design. In this activity, TRASER will automatically download the stored training system description that corresponds to the MSWS selected. Once identified, the "old" training system design must be evaluated to determine what was good and bad about the training systems design and performance. Also, the list of MOSs training by the "old" MSWS training system must be recorded to serve as a notional MOS list for the new NWS training system. In the last step, the training developer must determine whether the MSWS training system design can be used as the basis for a notional training system design, based on age, modernness and other factors. This activity establishes whether the MSWS training design is a suitable candidate for the initial notional training system design. If suitable, the design is adopted. If not suitable, then the design is dropped from further consideration. At this stage of development, selection criteria is particularly soft and is primarily the judgement of the training developer performing this set of functions.

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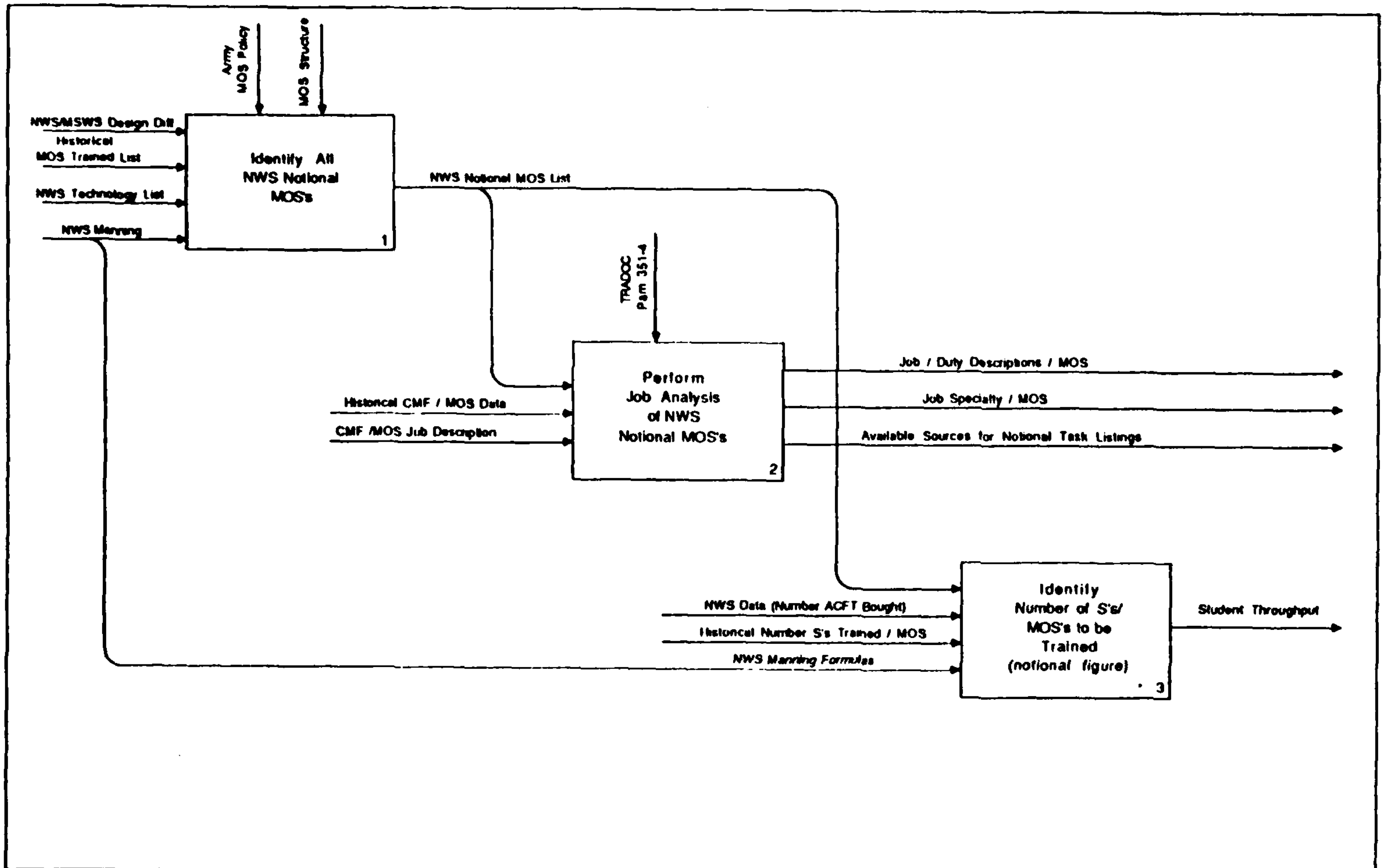


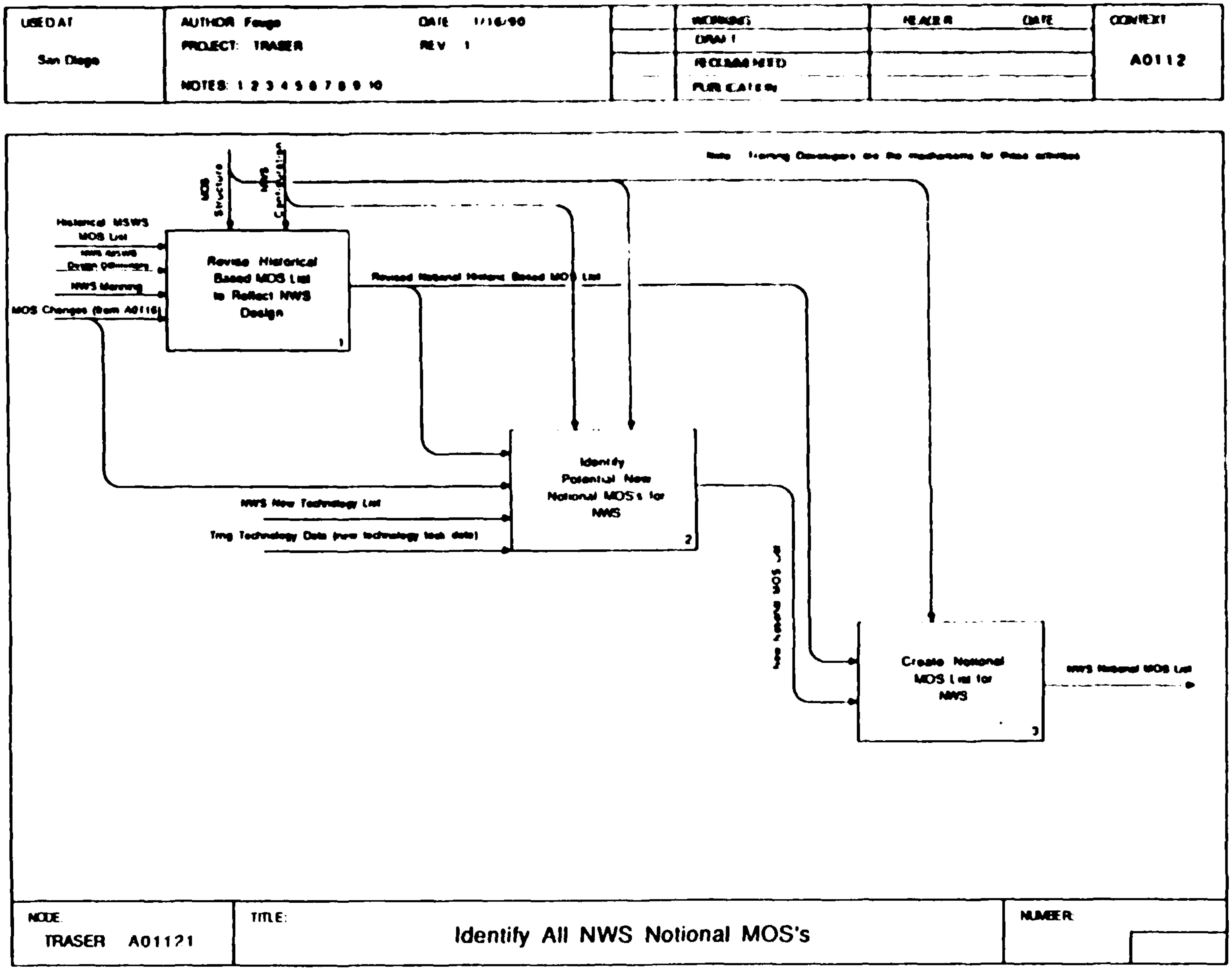
NODE: TRASER A0112

TITLE: Analyze Notional NWS MOS's to be Trained

NUMBER:

TRASER A0112 ANALYZE NOTIONAL NEW WEAPON SYSTEM (NWS) MOSs TO BE TRAINED

In this activity, the training developer must identify all MOSs that are likely to require training via the new training system, including operators, maintainers, and support personnel. Although it is not the formal responsibility of the training developer to determine proper MOS and Force Structure, a *notional* idea of possible new MOSs must be included in this estimate to avoid ignoring all of the possible training requirements of the new training system. New MOSs will be carried as notional until DA formally recognizes and approves the new MOS structure. This process may entail a job analysis and also a rough estimate of how many operators, maintainers, and support personnel will be trained in the new training system.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CONTEXT
A0112
MOS Structure
NWS Specification
Historical MSWS MOS List
NWS Manning
MOS Changes (from A0116)
Revise Historical Based MOS List to Reflect NWS Design
1
Revised Notional Historic Based MOS List
Identify Potential New Notional MOS's for NWS
2
NWS New Technology List
Trng Technology Data (new technology task data)
Create Notional MOS List for NWS
3
NWS Notional MOS List
NODE:
TRASER A01121
TITLE:
Identify All NWS Notional MOS's
NUMBER:

TRASER A01121 IDENTIFY ALL NWS NOTIONAL MOSs

The purpose of this activity is to establish a notional list of MOSs to be trained by the NWS training system. In this activity, design differences between the NWS and MSWS must be analyzed as they bear on notional MOS assignments to the NWS. The purpose of this step is to determine whether the MSWS MOS list can be used as is or whether it will require modification. If changes are required, new notional MOSs will be added by the Training Developer, but strictly on a notional or hypothetical basis. This intent is to ensure that all training requirements are identified and ad essed very early in the training system design and budgeting process.

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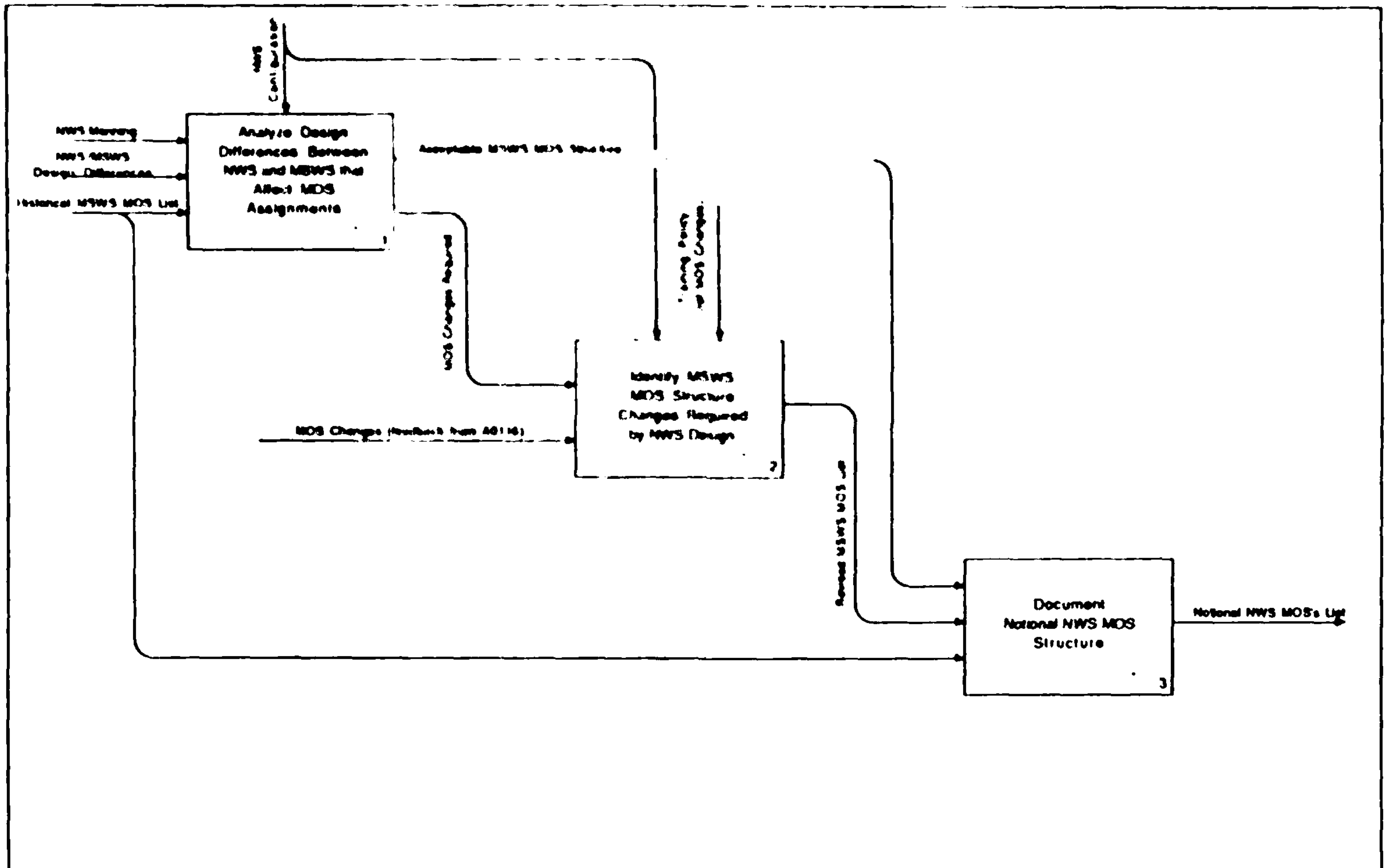
CONTEXT: A01121



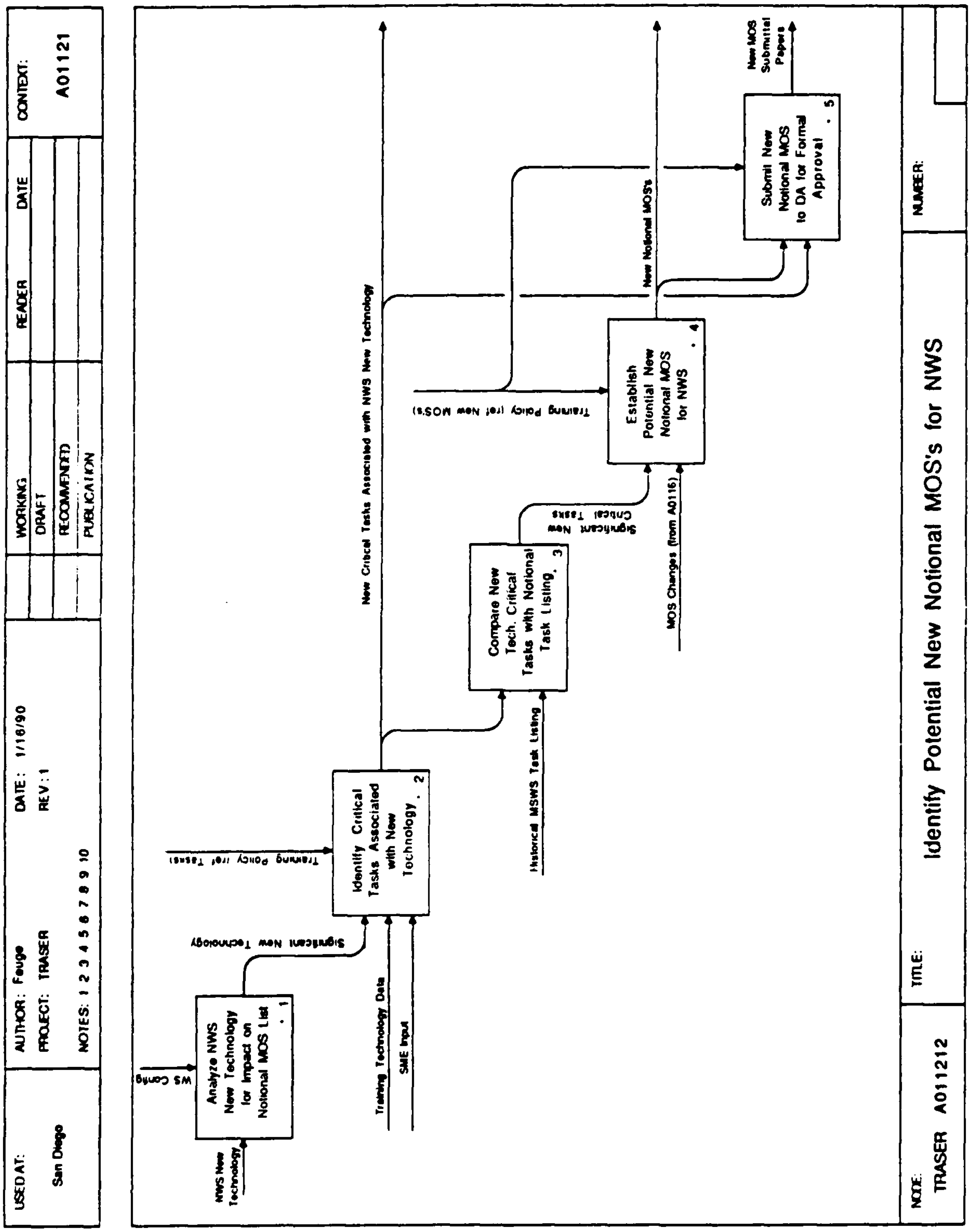
NODE: TRASER A011211

TITLE: Revise Historical Based MOS List to Reflect NWS Design

NUMBER:

TRASER A011211 REVISE HISTORICAL BASED MOS LIST TO REFLECT NWS DESIGN

In this activity, differences between the NWS and MSWS designs are used to refine the notional historical based MOS list. The purpose of this activity is to bring MOS assignments from older systems into closer alignment with modern systems. If the MSWS is fairly current, this step may not result in any changes. If, however, changes to the MOS structure are required, this analysis will form the basis of the supporting documentation needed for structure approval, by tieing weapon system requirements to personnel changes.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CONTEXT: A01121
NWS New Technology
WS Config
Analyze NWS New Technology for Impact on Notional MOS List . 1
Significant New Technology
Training Policy (ref Tasks)
Training Technology Data
SME Input
Identify Critical Tasks Associated with New Technology . 2
New Critical Tasks Associated with NWS New Technology
Historical MSWS Task Listing
Compare New Tech. Critical Tasks with Notional Task Listing . 3
Significant New Critical Tasks
MOS Changes (from A0116)
Training Policy (ref New MOS's)
Establish Potential New Notional MOS for NWS . 4
New Notional MOS's
Submit New Notional MOS to DA for Formal Approval . 5
New MOS Submittal Papers
NODE: TRASER A011212
TITLE: Identify Potential New Notional MOS's for NWS
NUMBER:

TRASER A011212 IDENTIFY POTENTIAL NEW NOTIONAL MOSs FOR NWS

In this activity, the possibility that present MOSs may not cover all critical tasks, particularly those emanating from new, high technology innovations in the NWS design, is accounted for. This step amounts to identifying the new technology in the current NWS design, determining critical tasks for that technology, and comparing those tasks to those in existing MOSs and job specialties. Where significant differences exist, new MOSs will be created by only on a purely notional, hypothetical basis. The intent is to ensure that all training requirements are accounted for in the design of the initial notional training system for the NWS.

USED AT:	AUTHOR: Feuge	DATE: 1/16/90		WORKING	READER	DATE	CONTEXT:
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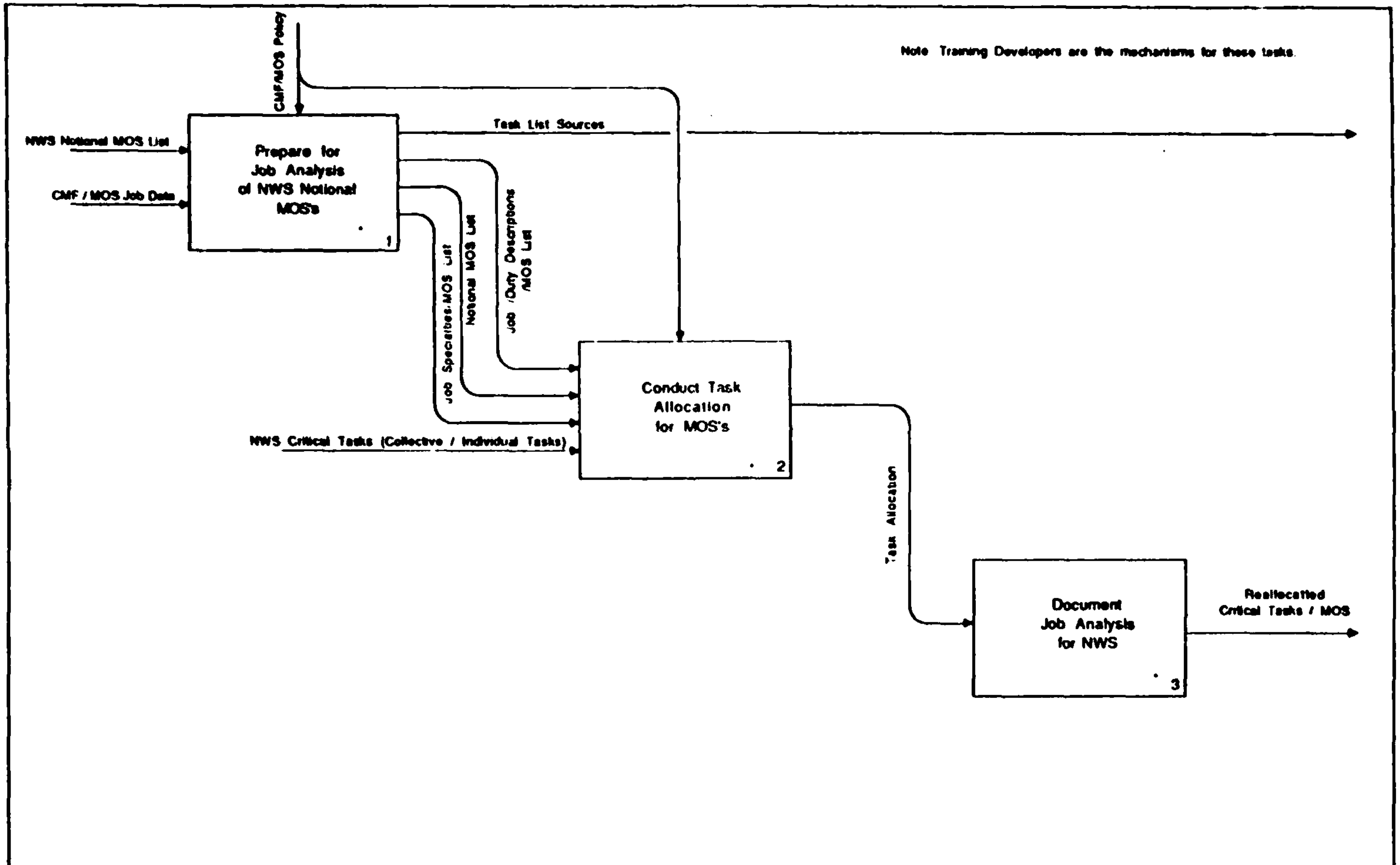
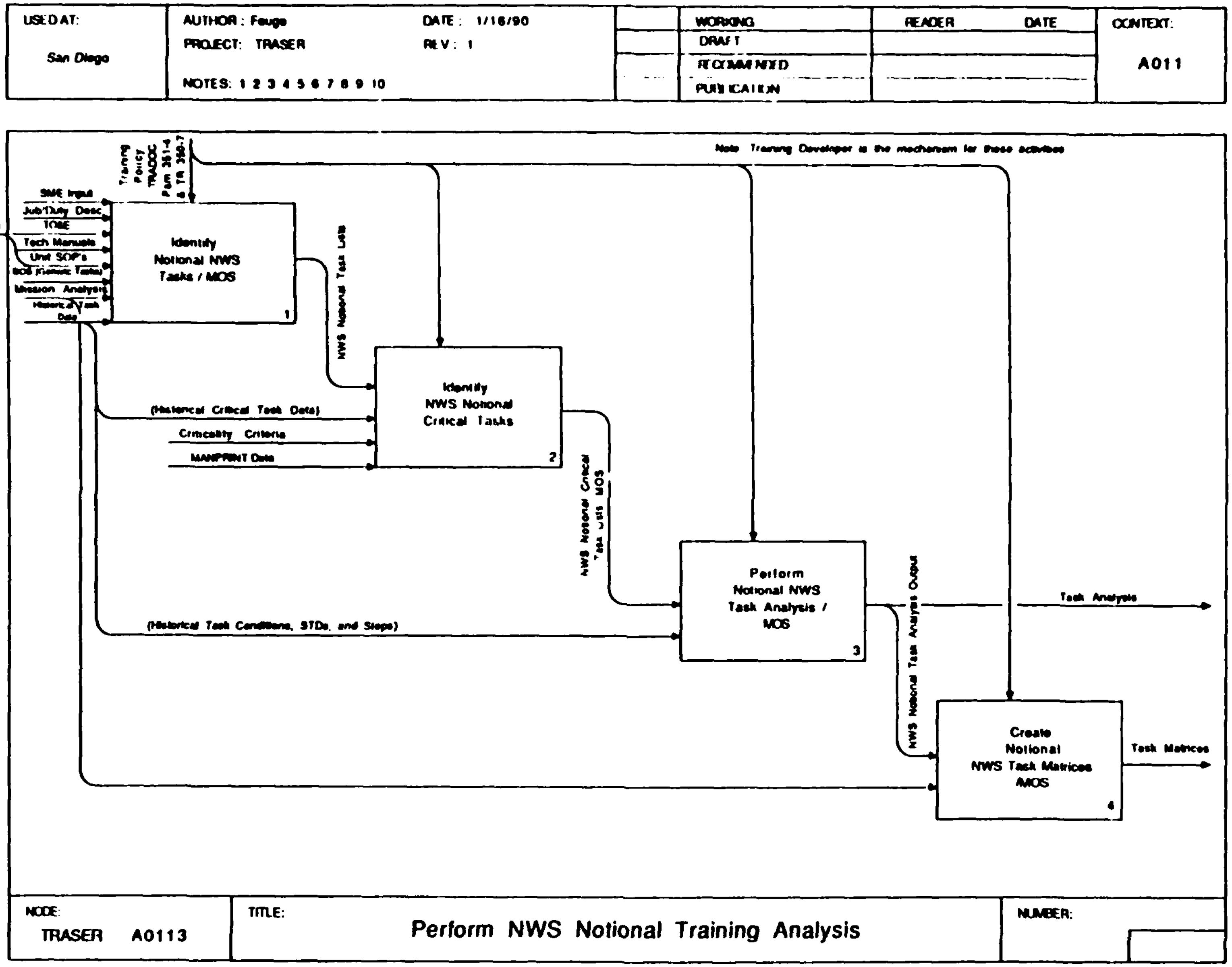


NODE:	TITLE:	NUMBER:
TRASER A01122	Perform Job Analysis of NWS Notional MOS's	

TRASER A01122 PERFORM JOB ANALYSIS OF NWS NOTIONAL MOSs

As required by TRADOC Pam 351-4, a job analysis is required whenever significant changes are made that affect the MOS structure. This activity identifies all relevant MOSs and ensures allocation of critical tasks to the selected notional MOS's.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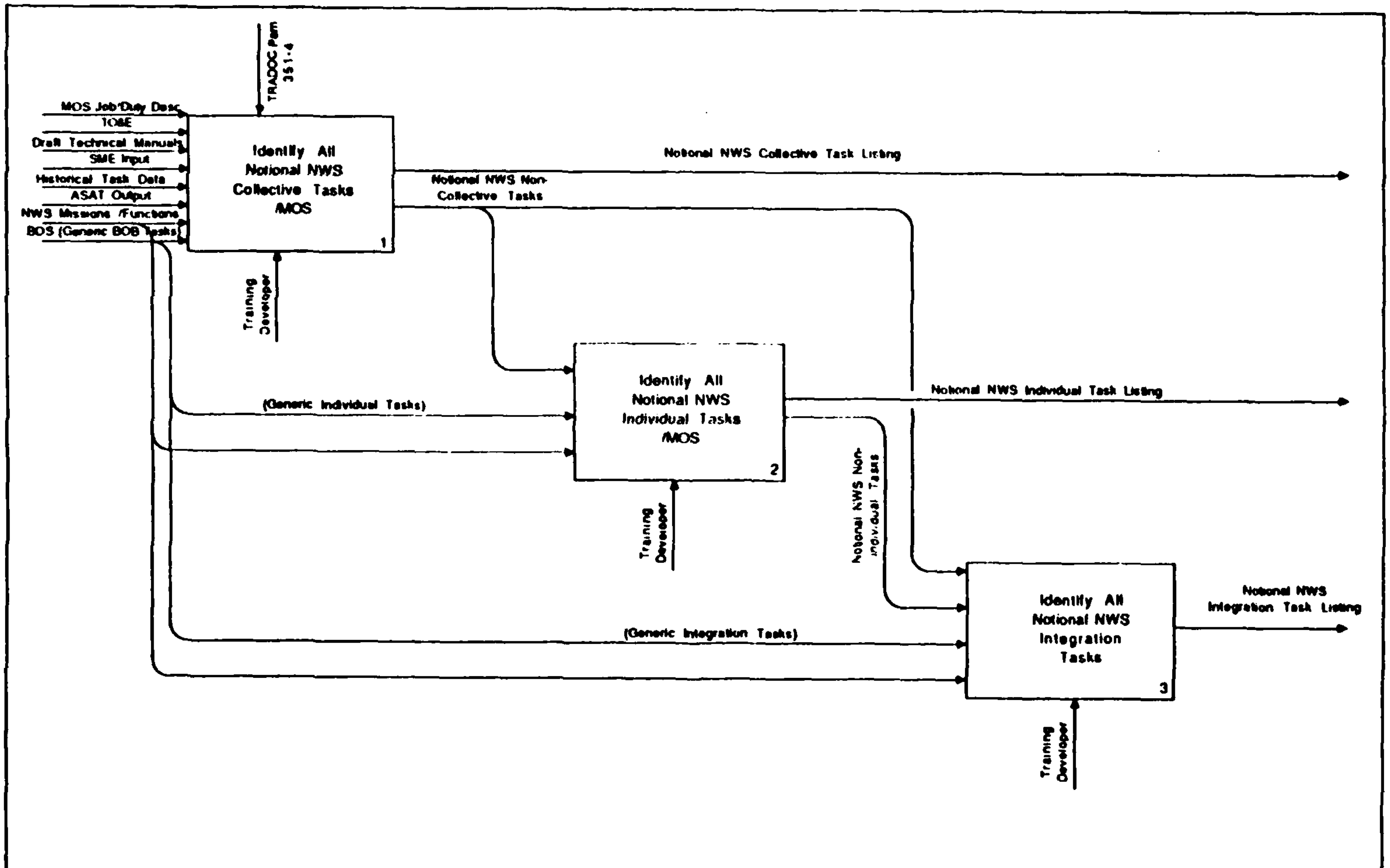
Note Training Developer is the mechanism for these activities
Training Policy TRADOC Pam 351-4 & TR 350-7
NWS Data
SME Input
Job/Duty Desc
TOE
Tech Manuals
Unit SOP's
Mission Analysis
Identify Notional NWS Tasks / MOS
1
NWS Notional Task Lists
Identify NWS Notional Critical Tasks
2
(Historical Critical Task Data)
Criticality Criteria
MANPRINT Data
NWS Notional Critical Task Lists MOS
Perform Notional NWS Task Analysis / MOS
3
(Historical Task Conditions, STDs, and Steps)
Task Analysis
NWS Notional Task Analysis Output
Create Notional NWS Task Matrices /MOS
4
Task Matrices
NODE:
TRASER A0113
TITLE:
Perform NWS Notional Training Analysis
NUMBER:

TRASER A0113 PERFORM NWS NOTIONAL TRAINING ANALYSIS

This activity satisfies part of TRADOC Reg 350-7 regarding application of systems approach methodology to training and follows TRADOC Pam 351-4 as to procedure. The training developer uses at least three sources to derive task listings for each MOS, including collective, individual, integration, and combined arms tasks. Historical task data from similar weapon systems could come from individual soldier training publications, LSA records, or ARTEP/ Drill manuals. From this listing, critical tasks are identified and subjected to further analysis to define conditions, standards, and other factors about the job. The last step is to develop crosswalks between types of training requirement data and MOS's in the analysis. These training analysis data are critical to the design effort in A012.

USED AT: San Diego	AUTHOR: Feuge PROJECT: TRASER NOTES: 1 2 3 4 5 6 7 8 9 10	DATE: 1/16/90 REV: 1	WORKING DRAFT RECOMMENDED PUBLICATION	READER	DATE	CONTEXT: A0113



NODE: TRASER A01131	TITLE: Identify All Notional NWS Tasks /MOS	NUMBER:

TRASER A01131 IDENTIFY ALL NOTIONAL NWS TASKS FOR EACH MOS

The purpose of this activity is to identify all operator, maintainer, and support personnel tasks associated with the NWS. These tasks include collective tasks, individual tasks, and integration tasks. In the Conceptual Exploration Phase of LCSMM, there will three main sources of task data: historical tasks from the training system for the MSWS, generic tasks from the Blueprint of the Battlefield, and tasks derived from analysis of the NWS design data. Because the NWS design is evolving and always in a state of flux, the latter source is difficult to achieve with any true validity.

USED AT:	AUTHOR: Feuge	DATE: 1/16/90		WORKING	READER	DATE	CONTEXT:
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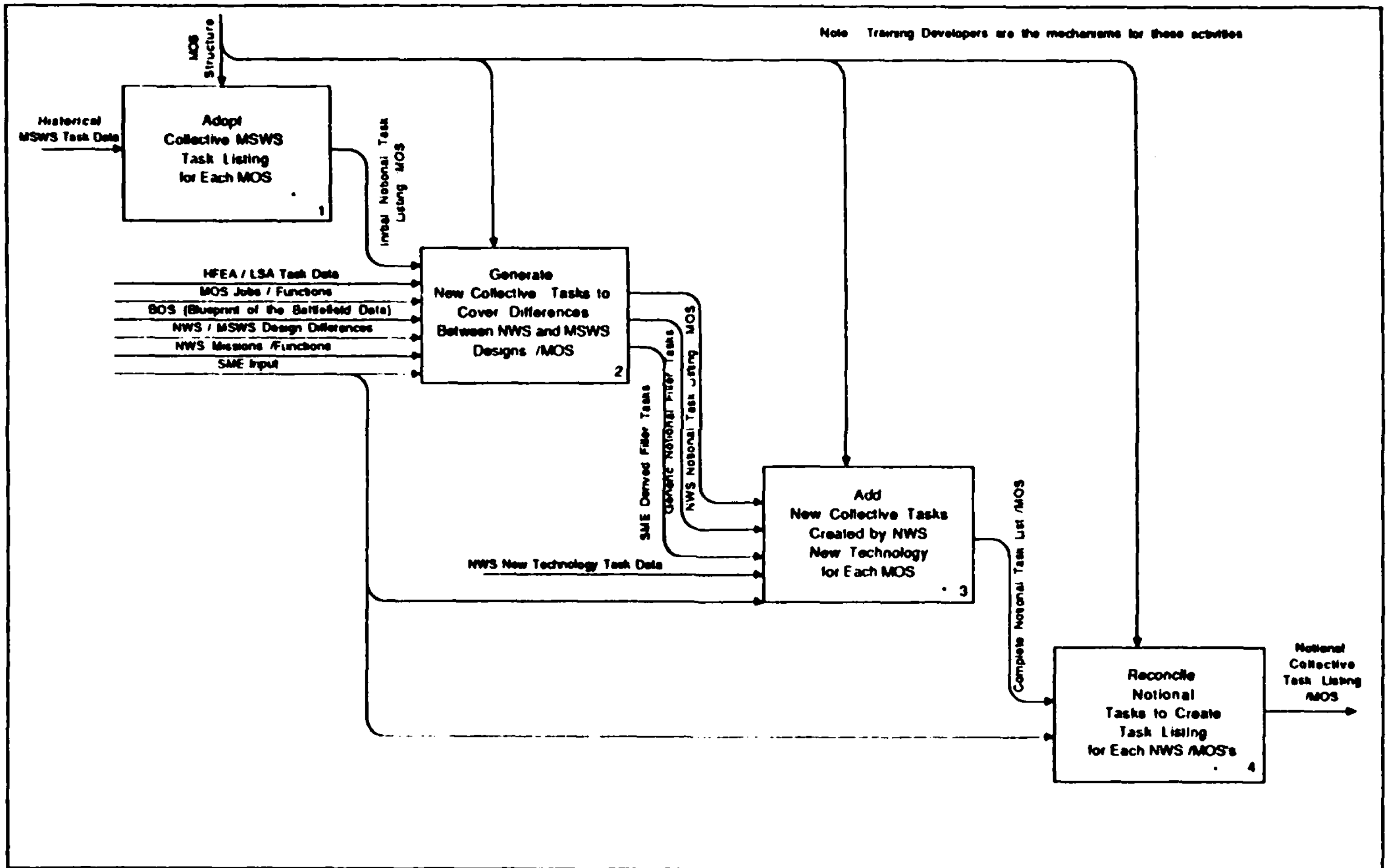

NODE:	TITLE:	NUMBER:
TRASER A011311	Identify All Notional NWS Collective Tasks /MOS	

TRASER A011311 IDENTIFY ALL NOTIONAL NWS COLLECTIVE TASKS FOR EACH MOS

In this activity, all notional collective tasks must be identified, before individual tasks are identified. At this stage in the LCSMM process, this activity can be accomplished in one of several ways. The training developer can begin with either the collective task listing from the MSWS training system or with a portion of the generic collective task list from the BoB or both merged together. This initial collective task list must be amended for differences between the NWS and the MSWS design if MSWS task data are used. Similarly, task specificity is required if generic tasks from the BoB are used. The source for amplifying task data is other NWS analyses, task data from new technology sources, or SME analyses, if possible. To produce a cohesive, complete task listing, all task data will need to be reconciled and integrated with SME input.

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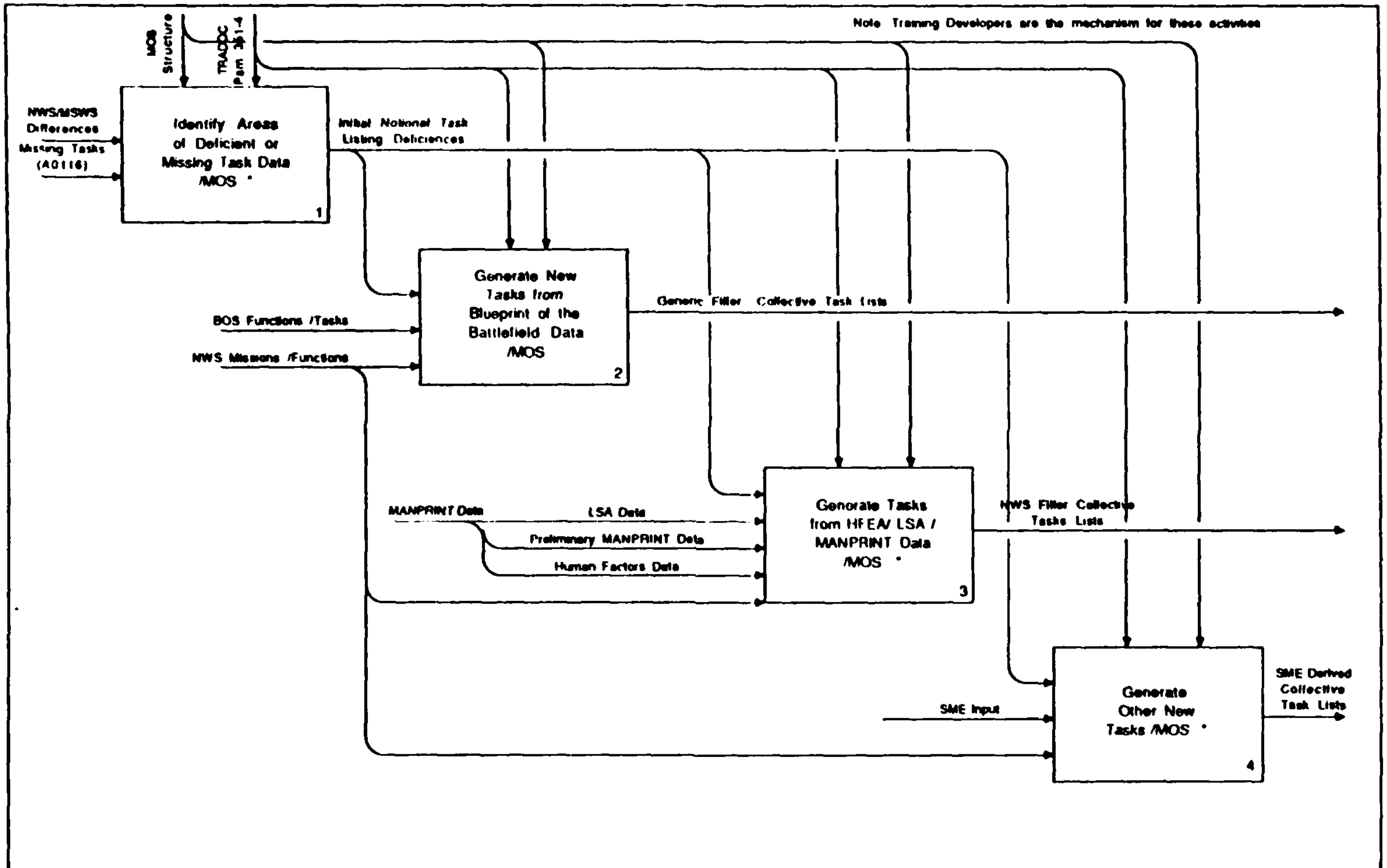

NODE: TRASER A0113112	TITLE: Generate New Notional Collective Tasks to Cover Differences Between NWS and MSWS Designs per MOS	NUMBER:

TRASER A0113112 GENERATE NEW NOTIONAL COLLECTIVE TASKS TO COVER DIFFERENCES BETWEEN NWS AND MSWS DESIGNS FOR EACH MOS

In this activity, collective tasks must be identified to satisfy deficient areas in the listing, caused by either incomplete knowledge of the NWS design, errors in analysis, or differences between the NWS and MSWS designs. After deficiencies are detected, appropriate task data are taken from BoB, Human Factors analyses, MANPRINT (if conducted), or LSA sources are used. SME input, if credible SMEs can be located and accessed this early in the NWS program, should also be used. Quality of task data should always be verified at this stage.

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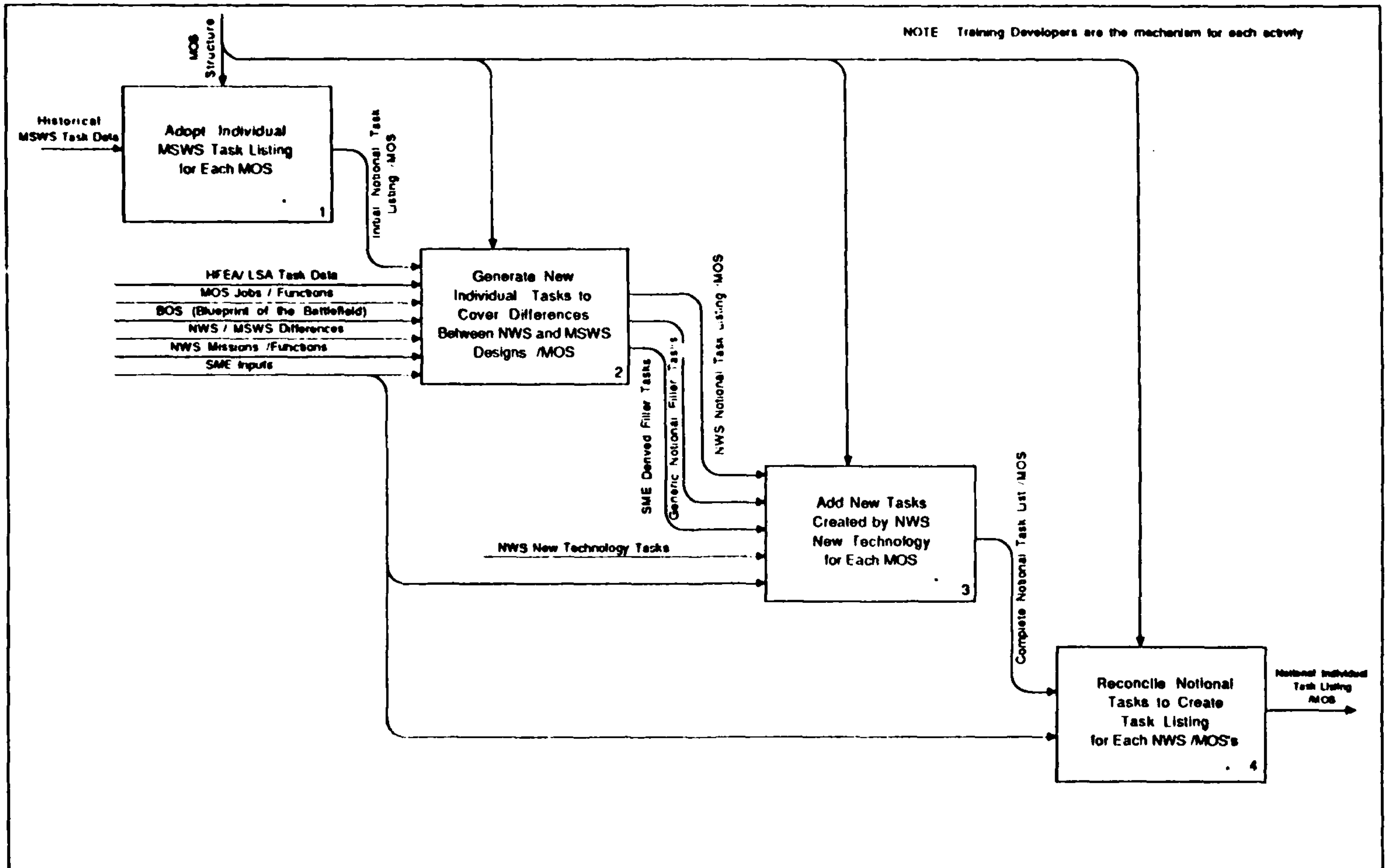

NODE:	TITLE:	NUMBER:
TRASER A011312	Identify All Notional NWS Individual Tasks /MOS	

TRASER A011312 IDENTIFY ALL NOTIONAL NWS INDIVIDUAL TASKS FOR EACH MOS

In this activity, all notional individual tasks must be identified, after collective tasks are identified. At this stage in the LCSMM process, this activity can be accomplished in one of several ways. The training developer can begin with either the individual task listing from the MSWS training system or with a generic individual task list from the BoB or both merged together. This initial individual task list must be amended for design differences between the NWS and the MSWS if MSWS task data are used. Similarly, task specificity is required if generic tasks are used. The source for amplifying task data is other NWS analyses, task data from new technology sources, or SME analyses, if possible. The use of technology could also eliminate tasks from historical weapon systems task lists. To produce a cohesive, complete task listing, all task data will need to reconciled and integrated with SME input.

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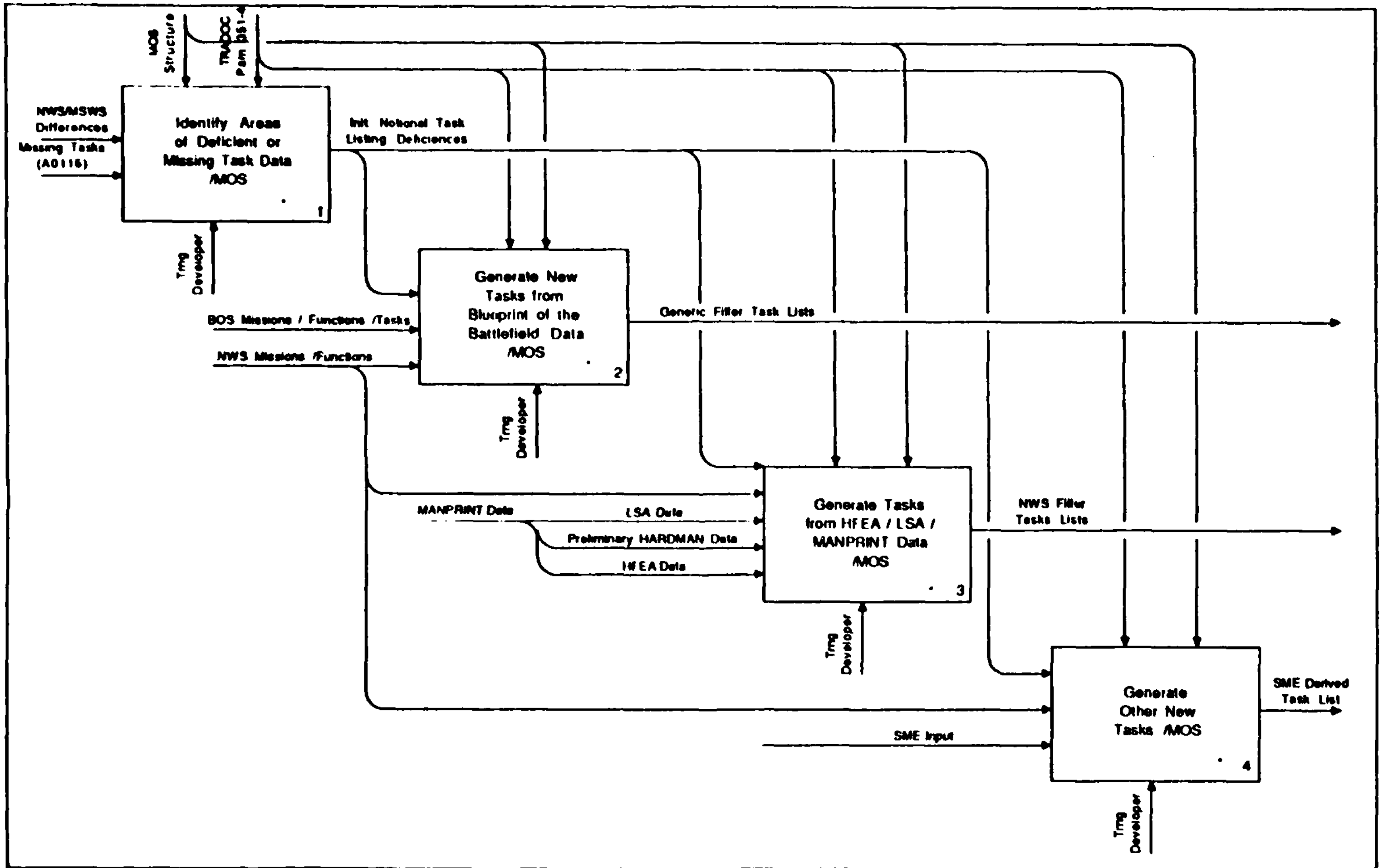

NODE:	TITLE:	NUMBER:
TRASER A0113122	Generate New Notional Individual Tasks to Cover Differences Between NWS and MSWS Designs per MOS	

TRASER A0113122 GENERATE NEW NOTIONAL INDIVIDUAL TASKS TO COVER DIFFERENCES BETWEEN NWS AND MSWS DESIGNS FOR EACH MOS

In this activity, individual tasks must be identified to satisfy deficient areas in the listing, caused by either incomplete knowledge of the NWS design, errors in analysis, or design differences between the NWS and the MSWS. After deficiencies are detected, appropriate task data are taken from BoB, human factors analyses, MANPRINT (if conducted), or LSA sources. SME input, if credible SMEs can be located and accessed this early in the NWS program, should also be used. Quality of task data should always be verified at this stage.

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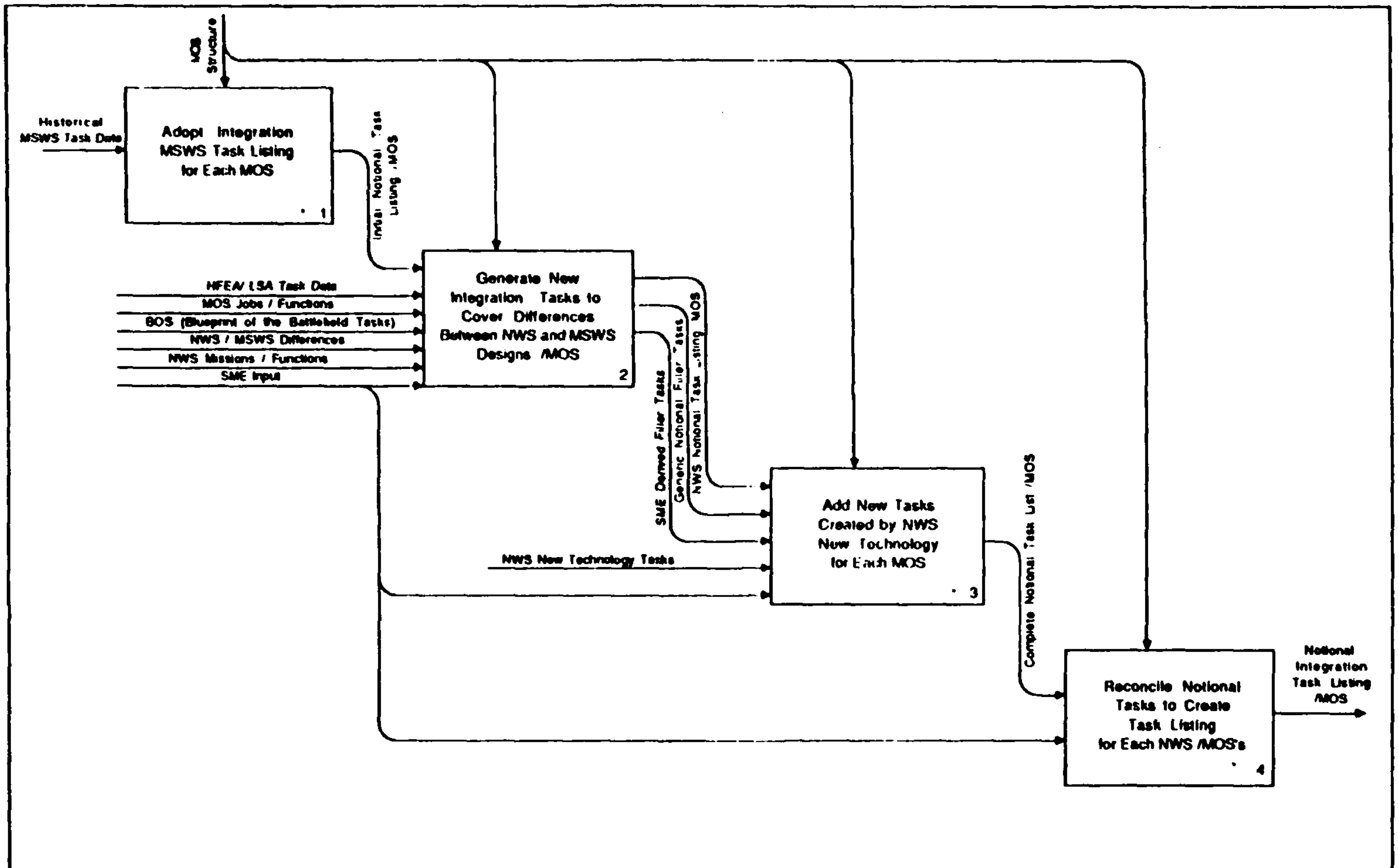

NODE: TRASER A011313

TITLE: Identify All Notional NWS Integration Tasks /MOS

NUMBER:

TRASER A011313 IDENTIFY ALL NOTIONAL NWS INTEGRATION TASKS FOR EACH MOS

In this activity, all notional integration tasks must be identified. At this stage in the LCSMM process, this block can be accomplished in one of several ways. The training developer can begin with either the integration task listing from the MSWS training system or with a partial generic integration task list from the BoB or both merged together. This initial integration task list must be amended for design differences between the NWS and the MSWS if MSWS task data are used. Similarly, task specificity is required if generic tasks are used. The source for amplifying task data is other NWS analyses, or SME analyses, if possible. To produce a cohesive, complete task listing, all task data will need to be reconciled and integrated with SME input.

USED AT:	AUTHOR: Feuge	DATE: 1/16/90		WORKING	READER	DATE	CONTEXT:
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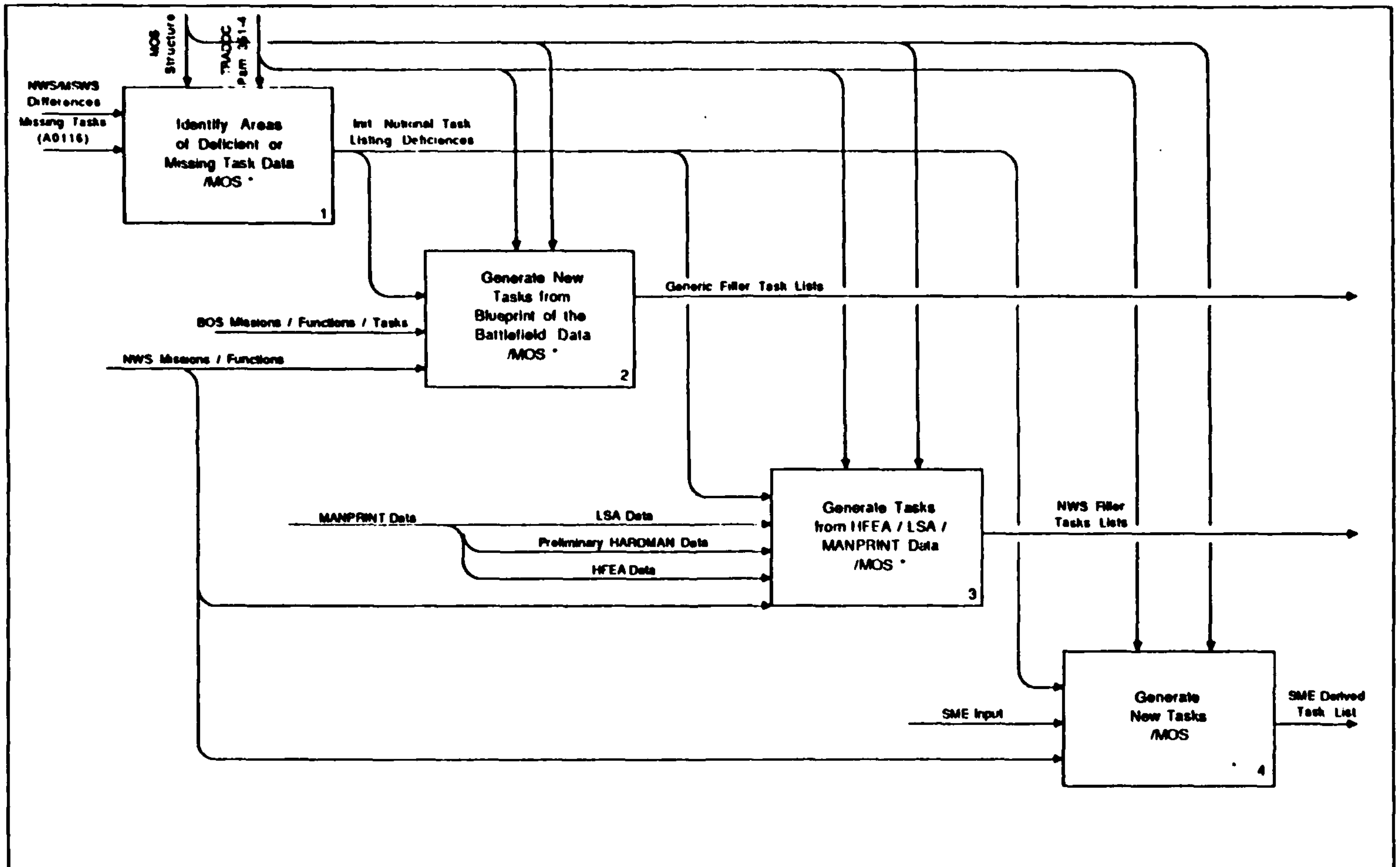

NODE:	TITLE:	NUMBER:
TRASER A0113132	Generate New Notional Integration Tasks to Cover Differences Between NWS and MSWS Designs per MOS	

TRASER A0113132 GENERATE NEW NOTIONAL INTEGRATION TASKS TO COVER DIFFERENCES BETWEEN NWS AND MSWS DESIGNS FOR EACH MOS

In this activity integration tasks must be identified to satisfy deficient areas in the listing, caused by either incomplete knowledge of the NWS design, errors in analysis, or design differences between the NWS and the MSWS. After deficiencies are detected, appropriate task data are taken from BoB, Human Factors analyses, MANPRINT (if conducted), or LSA sources. SME input, if credible SMEs can be located and accessed this early in the NWS program, should also be used. Quality of task data should always be verified at this stage.

USED AT:	AUTHOR: Feuge	DATE: 1/16/90		WORKING	READER	DATE	CONTEXT:
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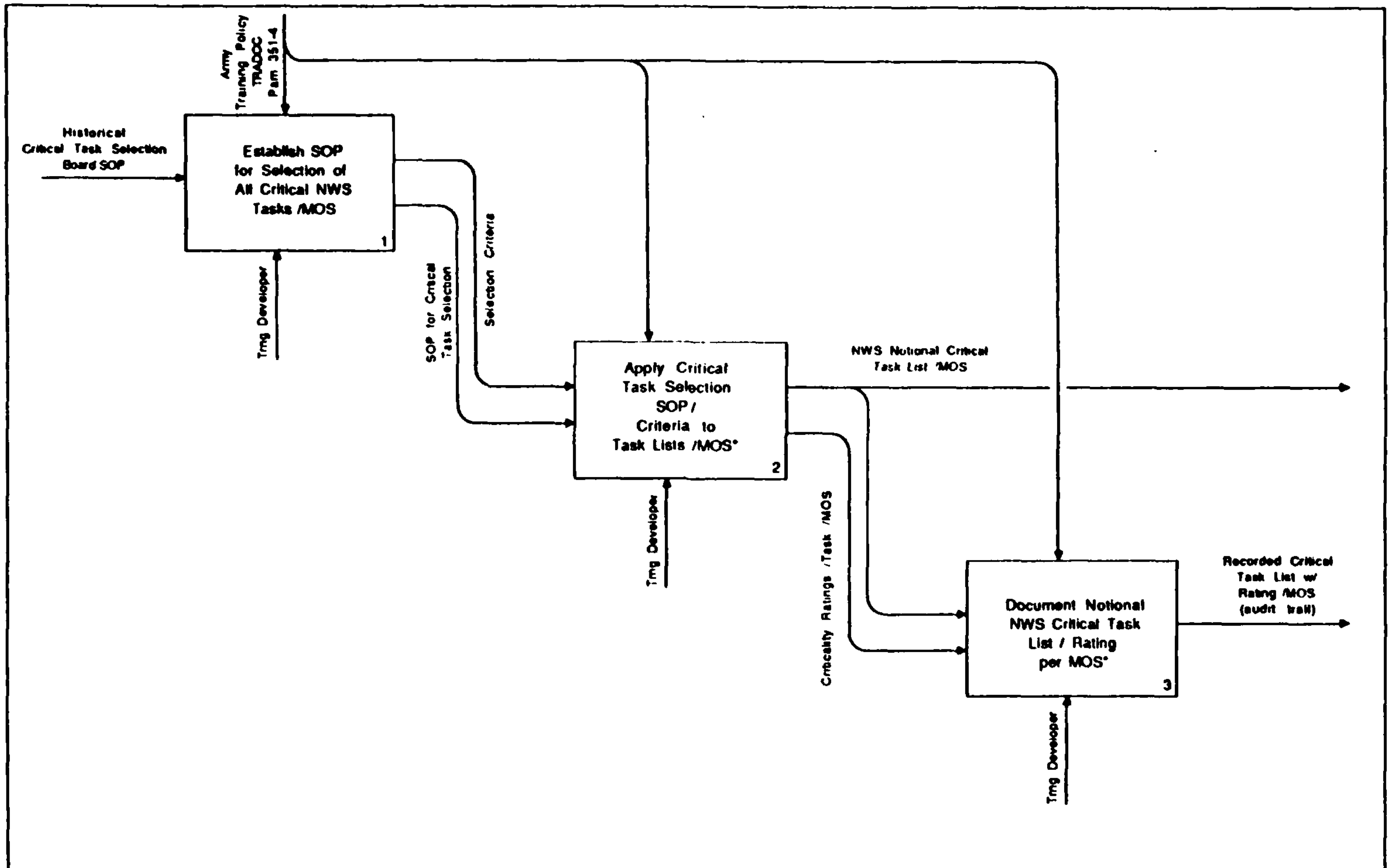

NODE:	TITLE:	NUMBER:
TRASER A01132	Identify NWS Notional Critical Tasks	

TRASER A01132 IDENTIFY NWS NOTIONAL CRITICAL TASKS

The purpose of this activity is to identify tasks that are critical to mission success or personnel safety. While normally performed by a Critical Task Board, the initial notional critical tasks will be identified by the training developer during the Concept Exploration Phase because the list is purely notional at this stage and subject to radical change. When the list stabilizes, the critical task list will be submitted to the Critical Task Board for formal approval.

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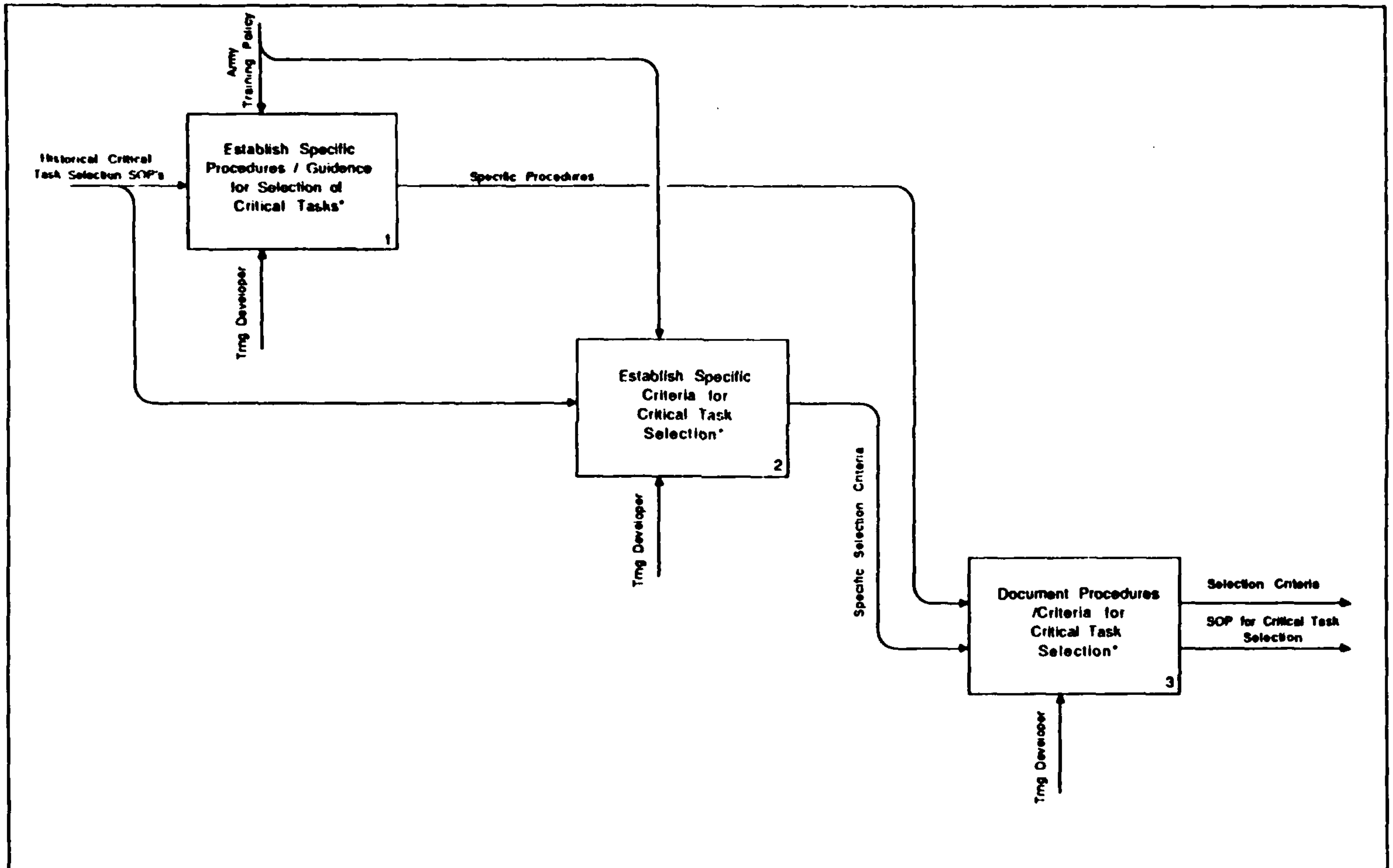

NODE:	TITLE:	NUMBER:
TRASER A011321	Establish SOP for Selection of All NWS Critical Tasks /MOS	

TRASER A011321 ESTABLISH SOP FOR SELECTION OF ALL NWS CRITICAL TASKS FOR EACH MOS

This activity establishes the process for determining if a task on a weapon system task list is critical. The specific procedures for classifying tasks, and general guidance are to be stated. Included as a part of this activity is the creating of specific criteria to be used within the specific procedures. All of the guidelines needed to perform this task are created in this activity.

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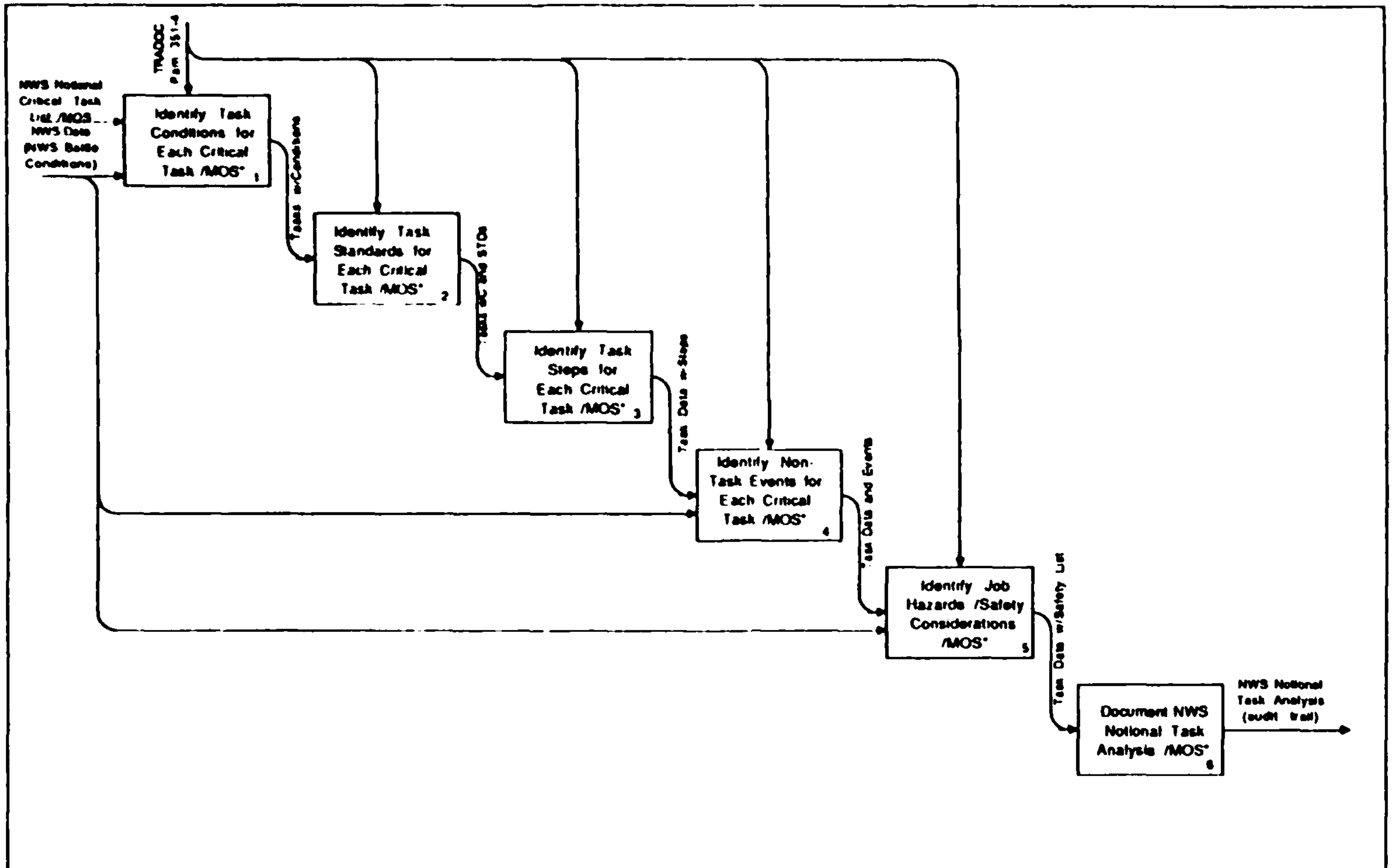

NODE:	TITLE:	NUMBER:
TRASER A01133	Perform NWS Notional Task Analysis /MOS	

TRASER A01133 PERFORM NWS NOTIONAL TASK ANALYSIS FOR EACH MOS

In this activity, the notional critical tasks are analyzed to establish task standards for performance, task conditions, and task steps. Also, non-task events are identified along with job safety hazard data to complete the task analysis for TRASER, non-task events are defined as cognitive processes by the task performer necessary to integrated multiple tasks in a constrained time frame. In addition, task cues or environment signals necessary to be present in a training device are also noted.

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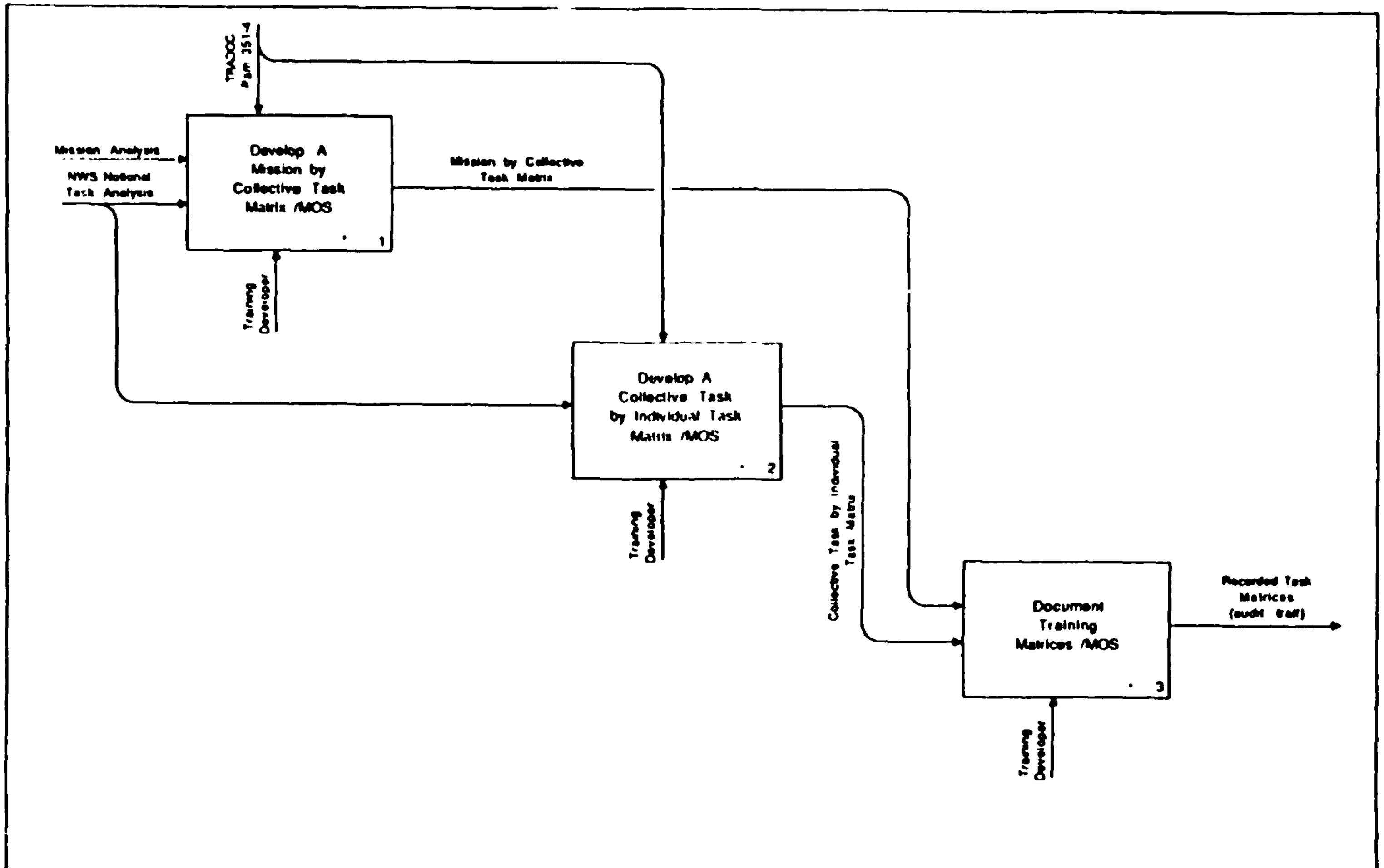

NODE:	TITLE:	NUMBER:
TRASER A01134	Create NWS Notional Task Matrices /MOS	

TRASER A01134 CREATE NWS NOTIONAL TASK MATRICES FOR EACH MOS

In this activity, the training developer is required to complete two matrices that provide a crosswalk between missions and collective tasks and between collective tasks and individual tasks. These are important to ensure internal consistency between task data and mission statements which reflect the realities of the battlefield. Documenting the tasks matrices includes storing of the analysis and results (matrices) in the automated portion of TRASER in order to maintain an audit trial of training system design decisions. It should be noted that these matrices could serve as a rough cut for ASAT in its production of similar matrices used in soldier training publications.

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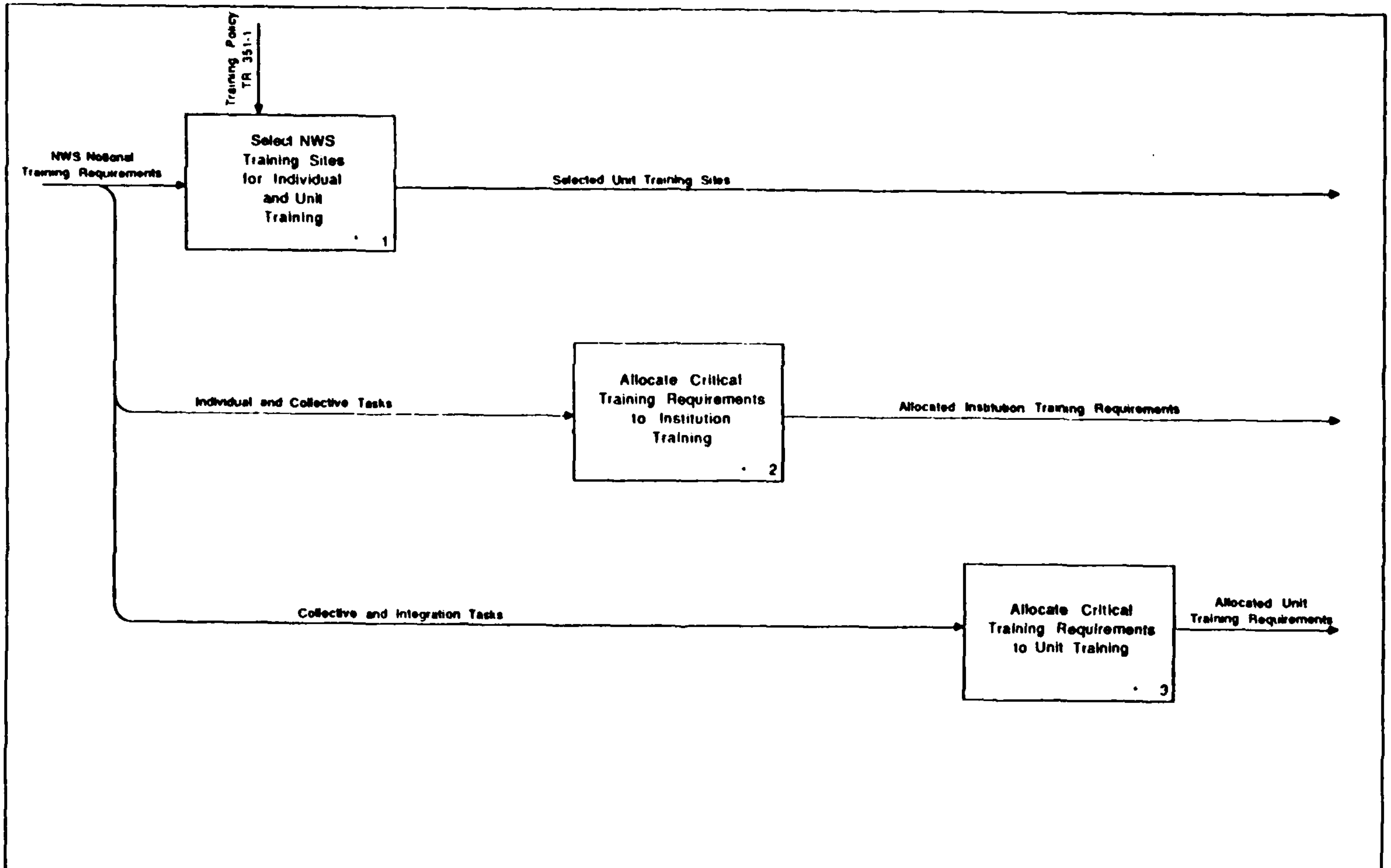

NODE: TRASER A0114 | TITLE: Allocate Training Requirements to Training Locations | NUMBER:

TRASER A0114 ALLOCATE TRAINING REQUIREMENTS TO TRAINING LOCATION

This activity of the TRASER Architecture enables apportionment of training tasks to either the institution or to the units in the field. Training sites and their facilities play a large part in this allocation, in addition to task considerations. The end result is a determination of where certain tasks will be initially trained and eventually sustained.

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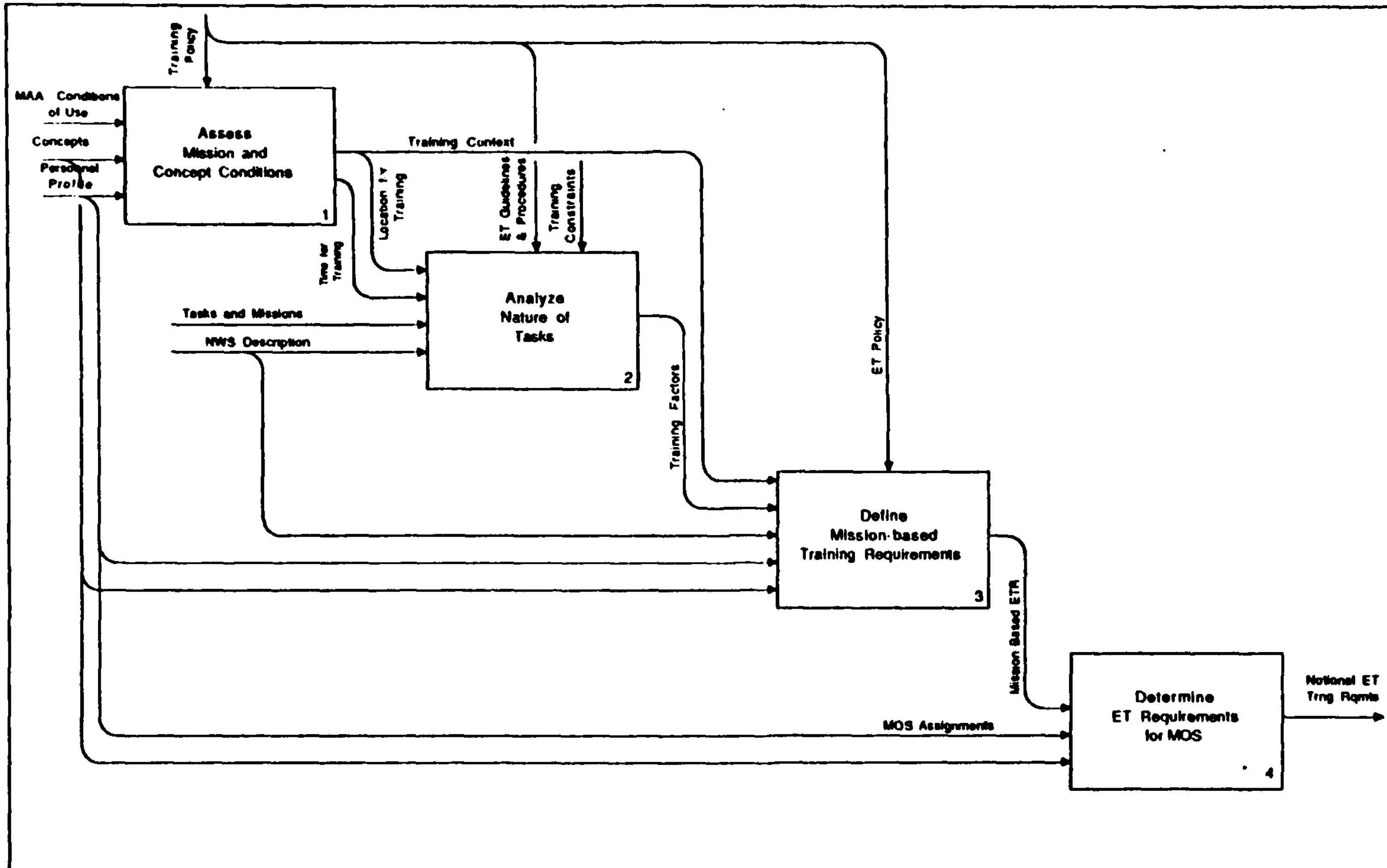

NODE: TRASER A0115

TITLE: Identify Notional Embedded Training Requirements (per MOS)

NUMBER:

TRASER A0115 IDENTIFY NOTIONAL ET REQUIREMENTS, PER MOS

This activity establishes the notional training requirements which should be met by the embedded training component of the total training system. As outlined in the TRASER system, identifying embedded training requirements (ETRs) takes place in conjunction with other efforts to identify training requirements for a system overall, and to specify other training media and approaches. Duplication of effort should be avoided whenever possible, and common databases and resources should be used for all training related assessments. The unique role of ET within the training system, caused by its interdependence and interactions with the prime system itself, forces the training developer to look beyond the NWS description and consider the system's mission, Army policy for employment, and Army training concepts to define the context of training. The context of training will be used with the traditional listings of tasks and weapon system descriptions to identify the nature of tasks to be trained, and define mission-based training requirements and constraints. Mission-based training requirements are addressed at the level of both acquisition and sustainment training, and also include training management issues applicable to ET. Personnel MOS descriptions from similar or predecessor systems will be used in conjunction with the mission-based ETRs to determine notional ET requirements for specific MOSs. As suggested in Volume 4 of 10: Identifying ET Requirements of the ET guidelines, (see Roth, 1988b), these notional training requirements should be assembled on a computer database management system when possible to aid in structuring, recording and analyzing data at later stages in the process. Volume 4 also suggests a structure for an ETR database.

The current description of the weapon system plays a role in defining these requirements, but some flexibility and feedback must be provided to the system designers to impact design changes based on requirements and training system constraints. The nature of these changes will become clear during development of the training concept, but will be directly impacted by the results of these requirements, and the opportunities identified in activity A011112, Identify Embedded Training Opportunities in New Weapons System Design.

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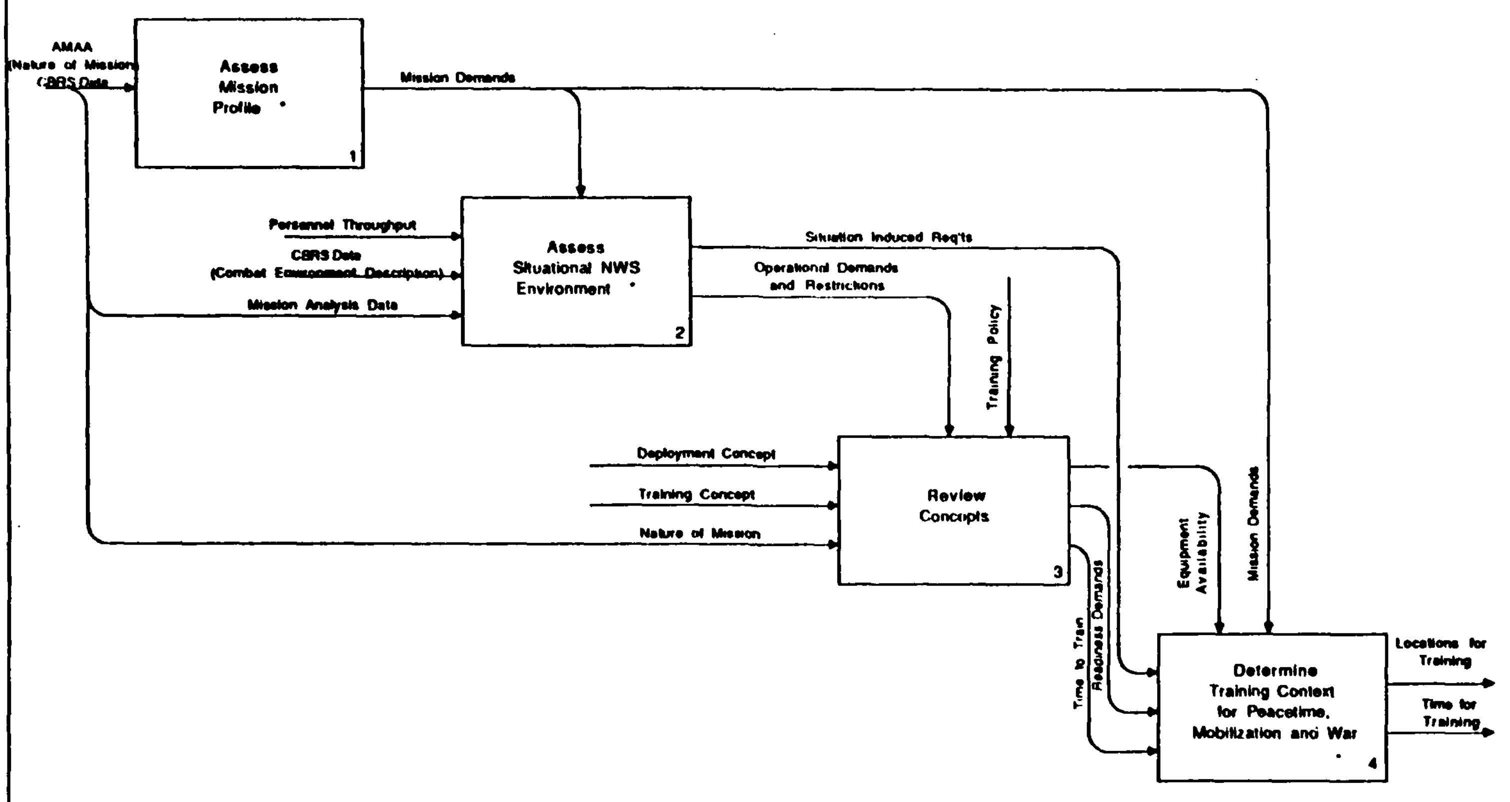

NODE: TRASER A01151

TITLE: Assess Mission and Context Conditions

NUMBER:

TRASER A01151 ASSESS MISSION AND CONCEPT CONDITIONS

This activity integrates Army policy and OPTEMPO information, and NWS situational and mission information to establish an overall context for administering training. The decision to go with ET is often based on policy, or recognition of an inability to achieve individual and crew readiness through any other training means due to unique situational or context factors or high turbulence. The output of this activity will aid in establishing the unit requirements for training. The requirements identification process considers ET for a full range of training environments including unit and institution. Requirements compare facility, equipment and personnel ability and availability, against constraints to administering training, such as limited locations and time for training, which exist independent of specific tasks to be trained. The nature of the NWS mission, the combat environment, and personnel quality, quantity and grade factors are evaluated to assemble a profile of training requirements unique to the environment in which the NWS operates. Similarly, where or how the NWS is deployed and the policies of training are reviewed to define when and where training could occur. These mission and context conditions are evaluated in light of peacetime and wartime demands on resources.

USED AT:	AUTHOR: Evans	DATE: 1/15/90		WORKING	READER	DATE	CONTEXT:
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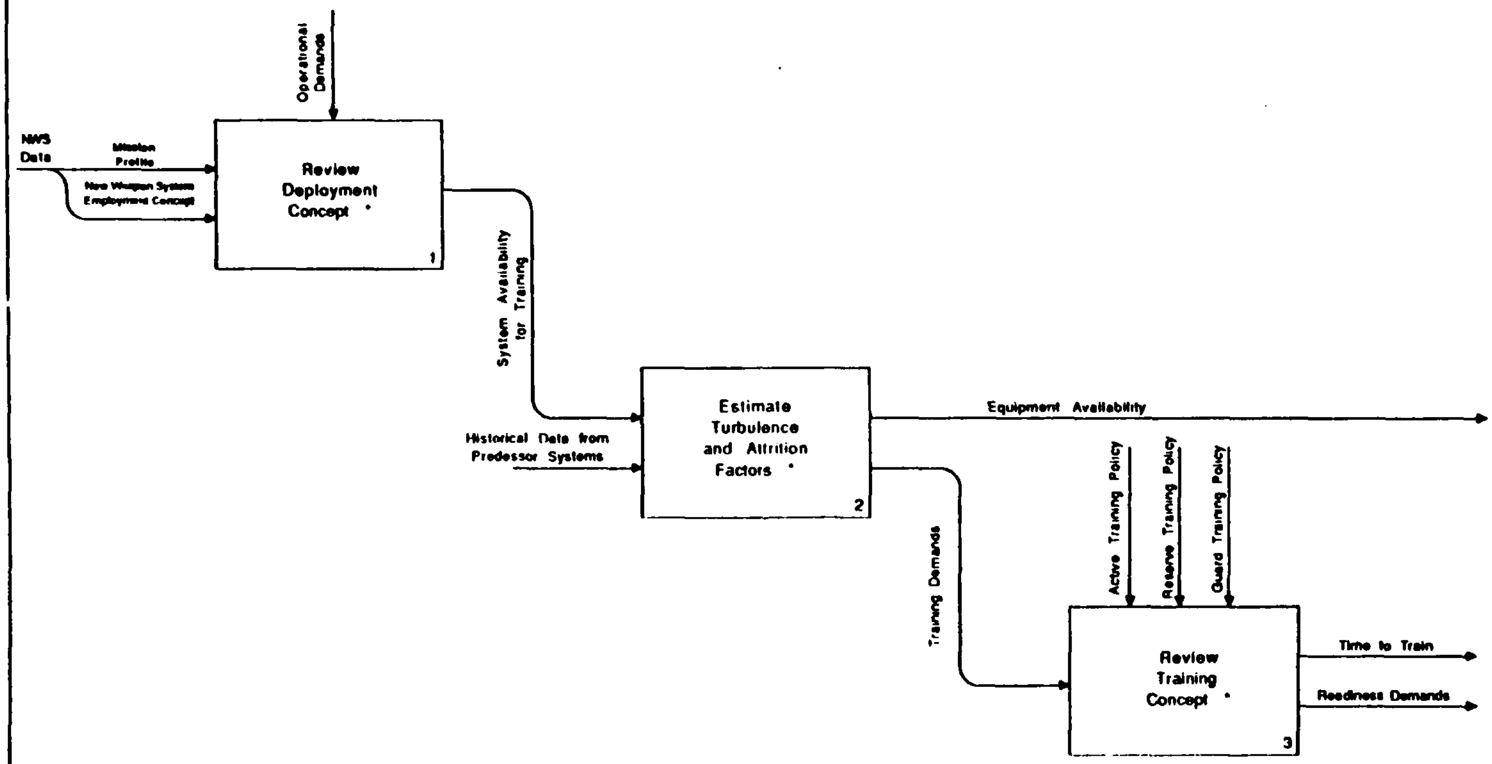

NODE:	TITLE:	NUMBER:
TRASER A011513	Review Concepts	

TRASER A011513 REVIEW CONCEPTS

This activity reviews existing documents on the weapon system employment concept, as well as any historical data from predecessor systems, the mission profile, and constraints due to operational demands and Army training policy, to identify the time available to train, equipment availability, and readiness demands. Policies for optimal system availability are compared against estimates of system and personnel turbulence and attrition to estimate demand for training, restrictions for availability, and final assessments for time and readiness. Active Army, Reserve, and Guard training policies are reviewed for their applicability and feasibility to the situations anticipated for the weapon system in question, and over conditions anticipated during peacetime, mobilization, and war.

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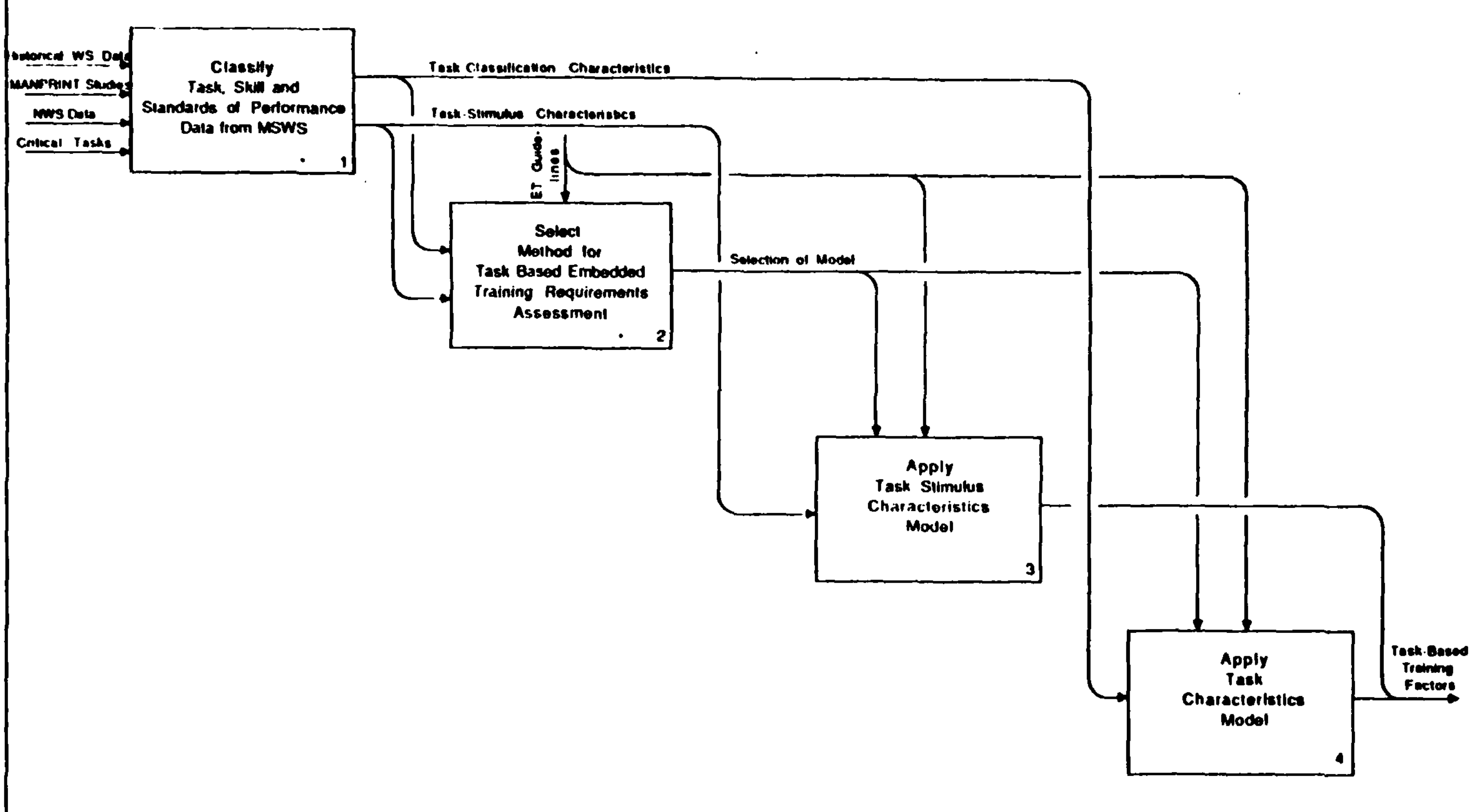

NODE:	TITLE:	NUMBER:
TRASER A01152	Analyze Nature of Tasks	

TRASER A01152 ANALYZE NATURE OF TASKS

This activity analyzes the nature of NWS operator and maintainer tasks to establish task-based training factors which could be served by ET. This activity selects and applies one of two models to establish the task-based demands for ET based on task criticality and perishability, or task stimulus characteristics. Information on tasks and missions, the weapon system description, and the training context are gathered and applied to the appropriate model. Validated data on tasks and missions and appropriate standards of performance, organized in a hierarchical structure, are obtained from other processes to TRASER. This data also indicates unique versus identical tasks with respect to the various mission phases; subsequent analyses focused on unique tasks. The two models are described in detail in Implementing Embedded Training (ET): Volume 2 of 10: Embedded Training as a System Alternative (see Strasel et al., 1988) and volume 4 of 10: Identifying ET Requirements (see Roth, 1988b). Within TRASER, it is not infeasible that both models would be used in the analysis, one to focus on the initial skills to be trained, and the other to view the perishability requirements. The process outlined here will most likely be performed several times in the training system development process, as new and more detailed task data become available. It is imperative to conduct the initial analysis as soon as possible to identify the NWS hardware and software features required to support ET.

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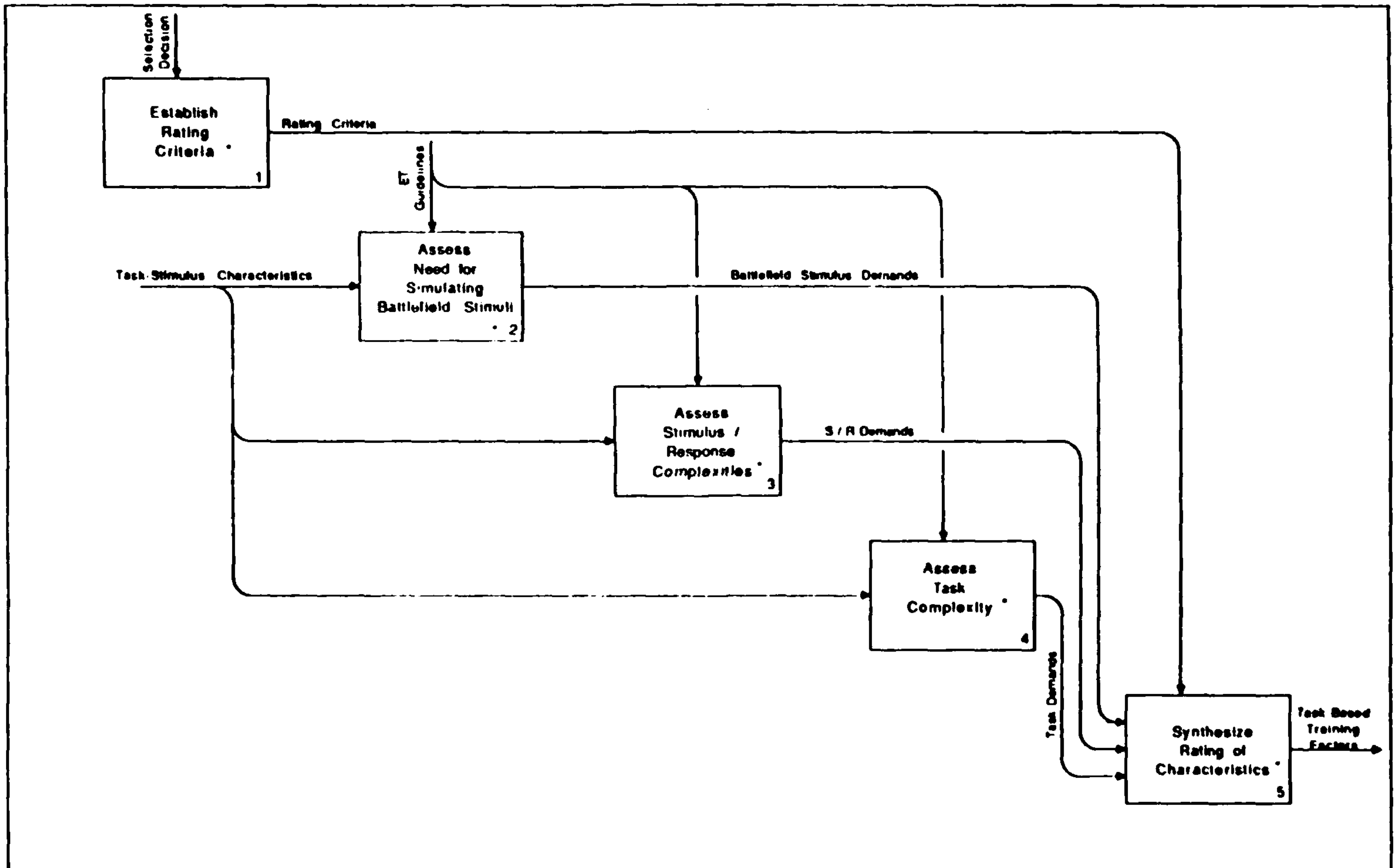

NODE:	TITLE:	NUMBER:
TRASER A011523	Apply Task Stimulus Characteristics Model	

TRASER A011523 APPLY TASK STIMULUS CHARACTERISTICS MODEL

The processes in this activity are derived from the Task Stimulus Characteristics model described in Volume 2 of the ET Guidelines (see Strasel et al., 1988). It allows the analyst to examine the stimulus characteristics of the operator and maintainer tasks that are believed to directly influence the need for training in any system. The weapon system data, mission and task characteristics, training context data, and performance criteria are reviewed. The extent to which various stimulus characteristics exist in the system are defined and rated using a magnitude assessment (e.g., to a very small extent, to a moderate extent, to a very high extent). The higher the rating and the more prevalent the characteristic, the stronger the support for the acquisition of ET in the system. Three activities of characteristics are presented in the diagram, which represent an aggregation of the seven categories presented in the original model. The need for simulating battlefield stimuli addresses the need for practice in recognizing and responding to battlefield stimuli. Stimulus- response complexity increases as the number of different stimulus sources or patterns, or the number of unique responses which must be made increases. Task complexity reflects the number of unique operator and maintainer tasks and subtasks in the system, and the presence of sensitive tracking tasks. Demands at the higher levels, e.g., block A015232 (Assess need for simulating battlefield stimuli), are considered more important than demands at the lower levels, e.g., block A0115234 (Assess task complexity). The outcome of the model is an assessment of the need for training which would support embedded training.

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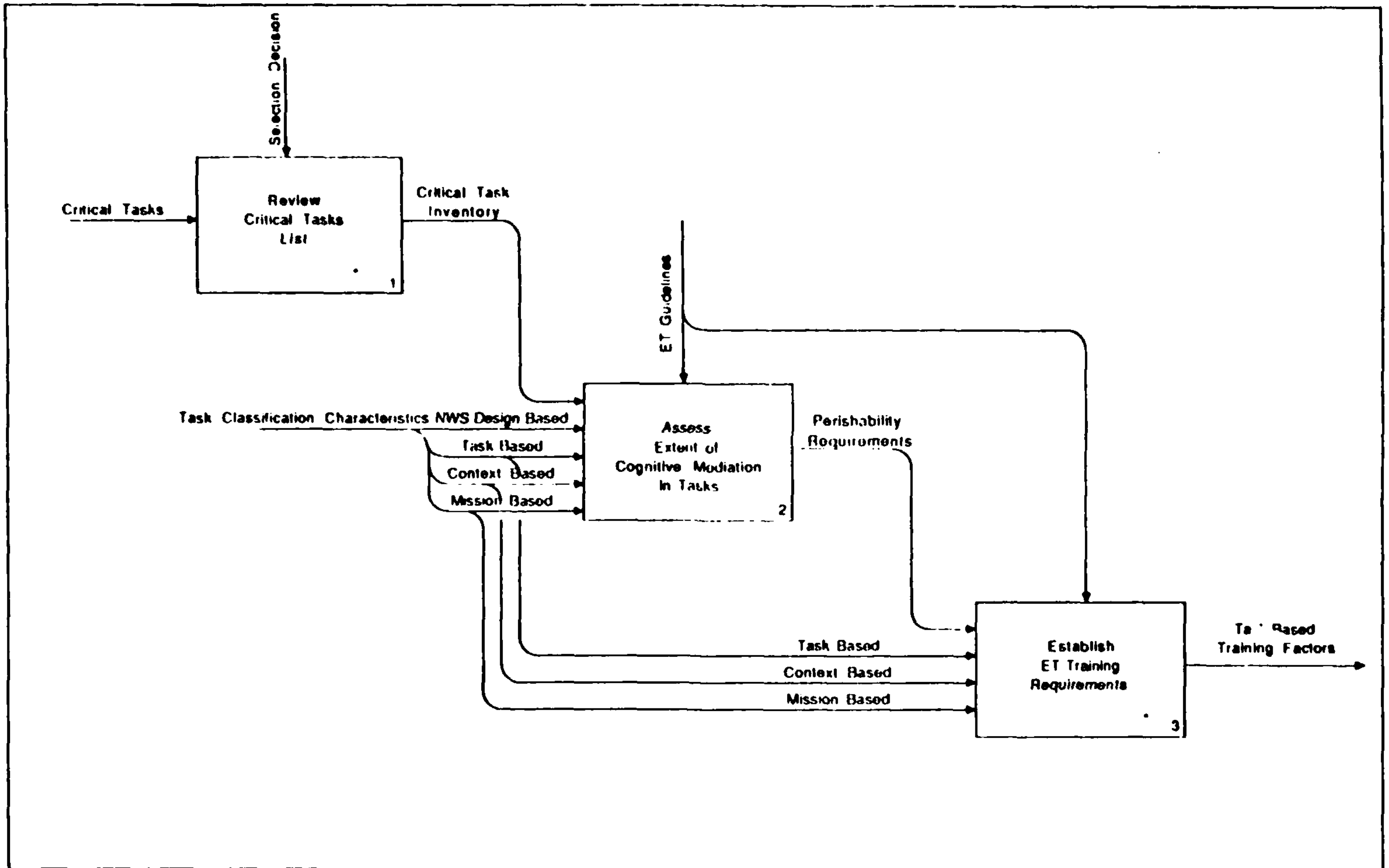

NODE:	TITLE:	NUMBER:
TRASER A011524	Apply Task Characteristics Model	

TRASER A011524 APPLY TASK CHARACTERISTICS MODEL

This activity depicts the second of the two models suggested to identify the need for embedded training, and considers the types of tasks which are required by the NWS and assesses the training implications. At this point in the requirements assessment, the focus is on identifying critical and perishable skills, where criticality is determined by the consequences of inadequate task performance, and perishability reflects the decay of the skills necessary to perform tasks. The product is a categorization of tasks into one of six categories which relate to the extent of need for additional training to sustain skills, over and above basic initial training. The underlying feature which discriminates between the categories is the extent of cognitive mediation of task performance required to learn and then perform the task or objective, and the effects of no reinforced practice on skill retention levels. The analysis utilizes the critical task inventory prepared in earlier stages of the analysis, (see activity A0113), as well as the total task listing to assess perishability. It is imperative that judgements from subject matter experts support the assessment of task criticality, which were used in assembling the critical task inventory.

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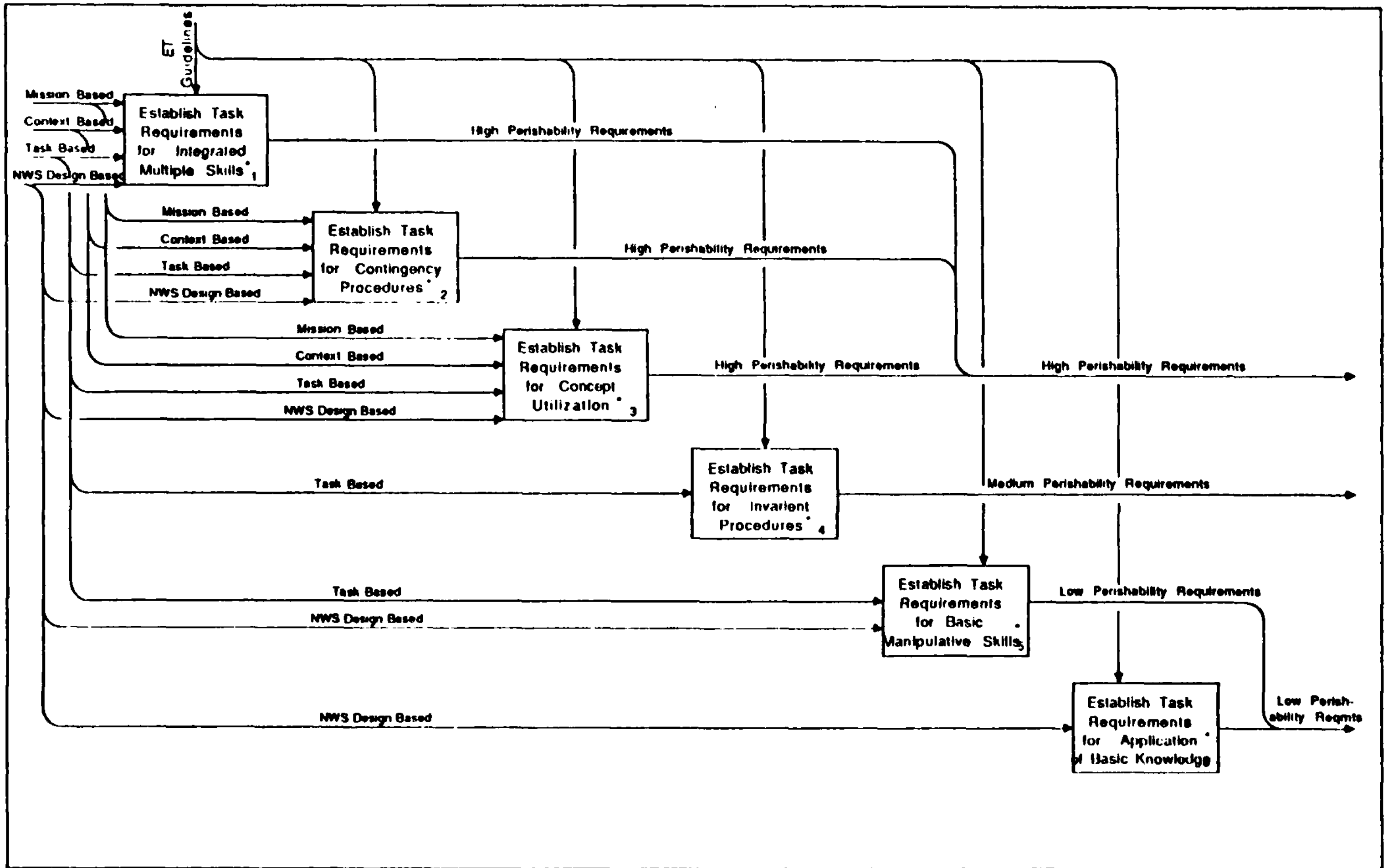

NODE: TRASER A0115242

TITLE: Assess Extent of Cognitive Mediation in Tasks

NUMBER:

TRASER A0115242 ASSESS EXTENT OF COGNITIVE MEDIATION IN TASKS

This activity reviews task performance objectives for the NWS with respect to the six categories of cognitive mediation and establishes a perishability requirement. Task, mission, and operational scenario data are considered. Highly variable scenarios or variety in contexts, coupled with a requirement for integrated multiple skills leads to a high demand for frequent reinforced practice and directed training exercises to maintain the skill coordination elements of performance. Similarly, the presence of contingency procedures or concept utilization requires frequent practice to reinforce behavior. Tasks possessing these characteristics also have a significant perishability factor, and are strong candidates for inclusion in ET. As the extent of mediation decreases in later stages of acquisition training, so does the need for ET. If ET is seen as having a role in acquisition as well as sustainment training, the low perishability requirement of basic manipulative and invariant procedure task characteristics may be overridden by the demands of the expanded role of ET. As suggested in Volume 4 of the ET guidelines (see Roth, 1988b), certainty codes should accompany the assessments of cognitive mediation and perishability and be reflected in the ETR database, if one is used.

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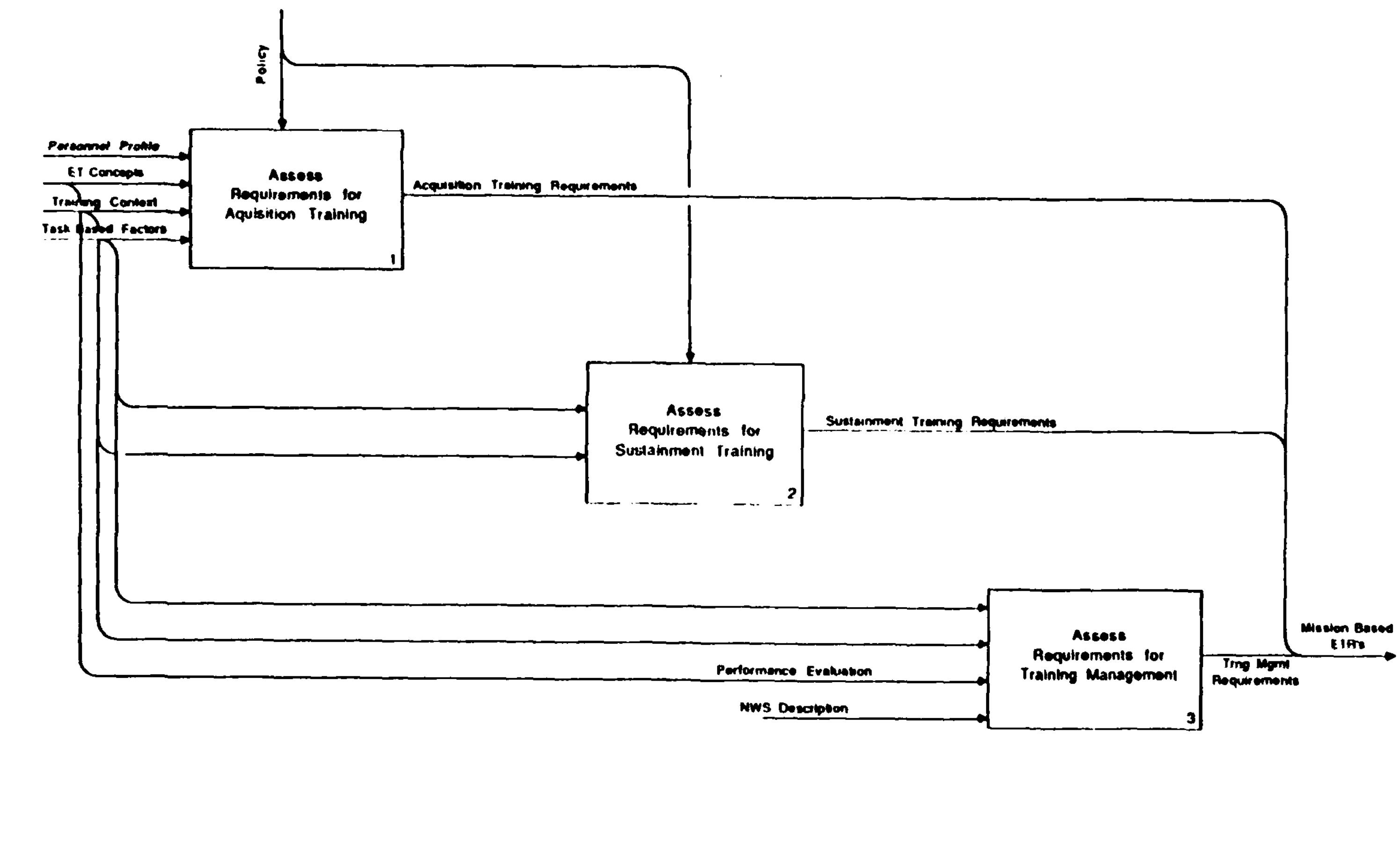

NODE:	TITLE:	NUMBER:
TRASER A01153	Define Mission Based Training Requirements	

TRASER A01153 DEFINE MISSION BASED TRAINING REQUIREMENTS

This activity integrates the content and task-based factors identified in earlier activities with training concepts, personnel profiles, and the NWS description to establish requirements for acquisition and sustainment training, and training management. Army training policy serves as a constraint in determining acquisition and sustainment requirements. This, and succeeding activities, maintain the mission orientation toward et requirements. Each independent process is designed around a series of questions which rely on the previously defined information. All requirements are assembled into an overall set for use in the training concept development activity.

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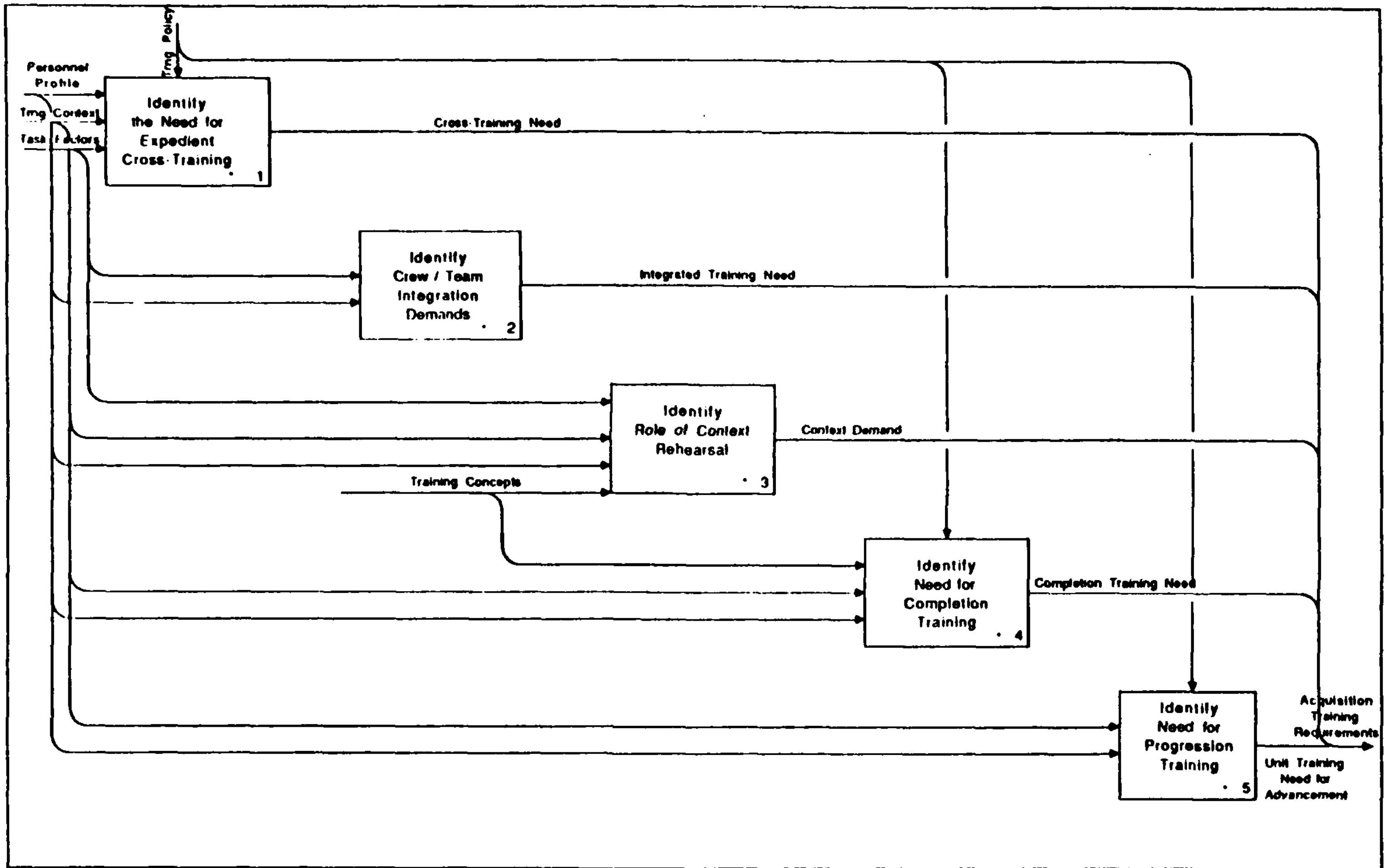

NODE:	TITLE:	NUMBER:
TRASER A011531	Assess Acquisition Training Requirements	

TRASER A011531 ASSESS ACQUISITION TRAINING REQUIREMENTS

In assessing acquisition training requirements, skill acquisition is considered in light of attrition, turnover, team integration, mission context, and skill progression and entry level training. The intent here is to view ET as an augmentation to acquisition training, filling in the gap in new skill introduction and acquisition for special cases. Individual and team performance objectives are considered as the characteristics of the population under study. The special cases include expedient cross training, crew orteam integration, context update and rehearsal, completion, and cross training for alternate skill and grade levels. Expedient cross training arises during peacetime, but is exacerbated during wartime situations. The presence of untrained soldiers in the operational environment, and the nature of the tasks to support such random assignments indicate a need for ET. A high reliance on integrated team performance, and the need for group training time even among fully trained individuals also suggest a need for ET. Changing operational environments which drastically affect performance suggest that ET may be appropriate for context rehearsal. A constant flow of replacements with inadequate individual proficiency suggests the use of ET for roundout training. Finally, as soldiers prepare to progress through ranks, the nature of the skills and the opportunities for training at the unit could suggest ET as an alternative.

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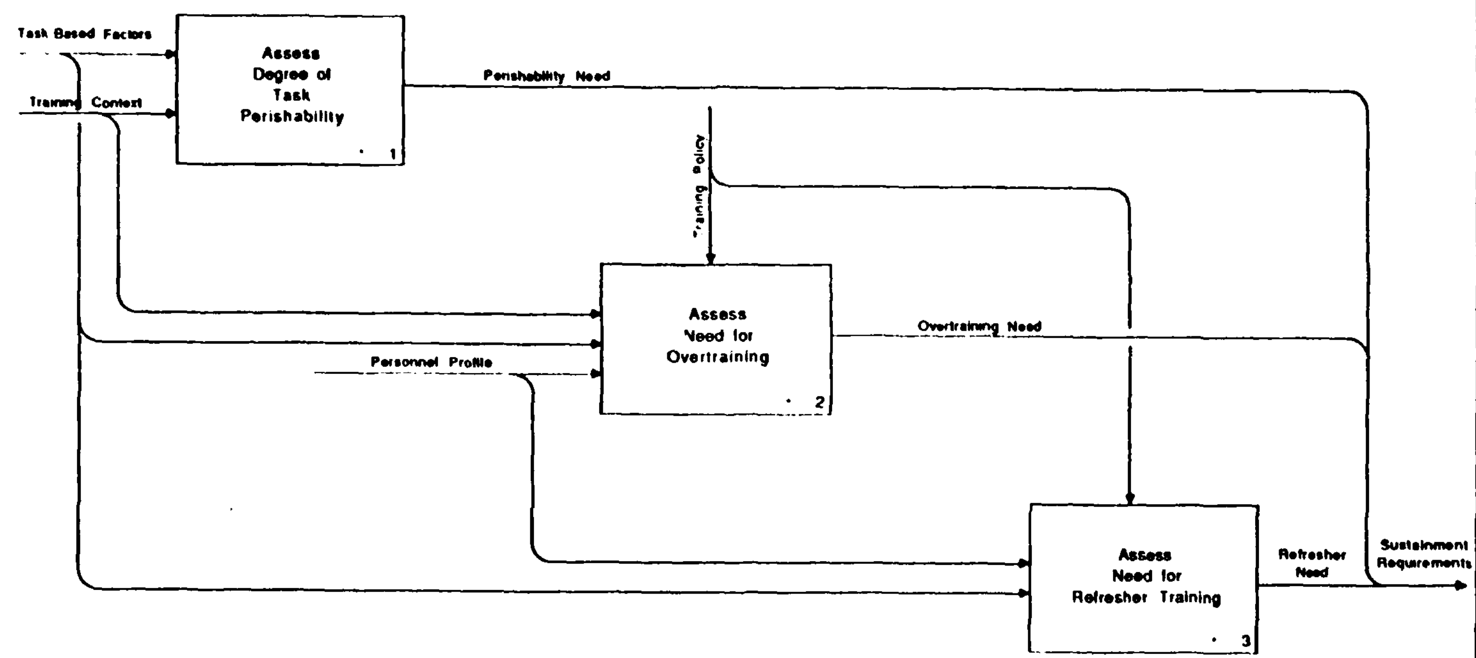

NODE:	TITLE:	NUMBER:
TRASER A011532	Assess Sustainment Training Requirements	

TRASER A011532 ASSESS SUSTAINMENT TRAINING REQUIREMENTS

ET sustainment training requirements consider task perishability, skill mastery, and refresher training, at the levels of both individual and team performance. Task based factors, including skill perishability indicators, and the training context, serve as inputs, while the training policy controls the processes. Previously defined task characteristics, from A01152 (ANALYZE NATURE OF TASKS), identified the perishable skills and knowledges applicable to this NWS. In general, when ten percent or more of the skills are considered perishable, ET should be considered as a training alternative. In combat situations accompanied with stress or continuous operations, over training is desirable, although the ease of attaining sufficient skill mastery is related to the task complexity. Refresher training at the sustainment level suggests that soldiers possess the basic skills of acquisition training, but could benefit from adaitional training to attain currency on operational or combat operations.

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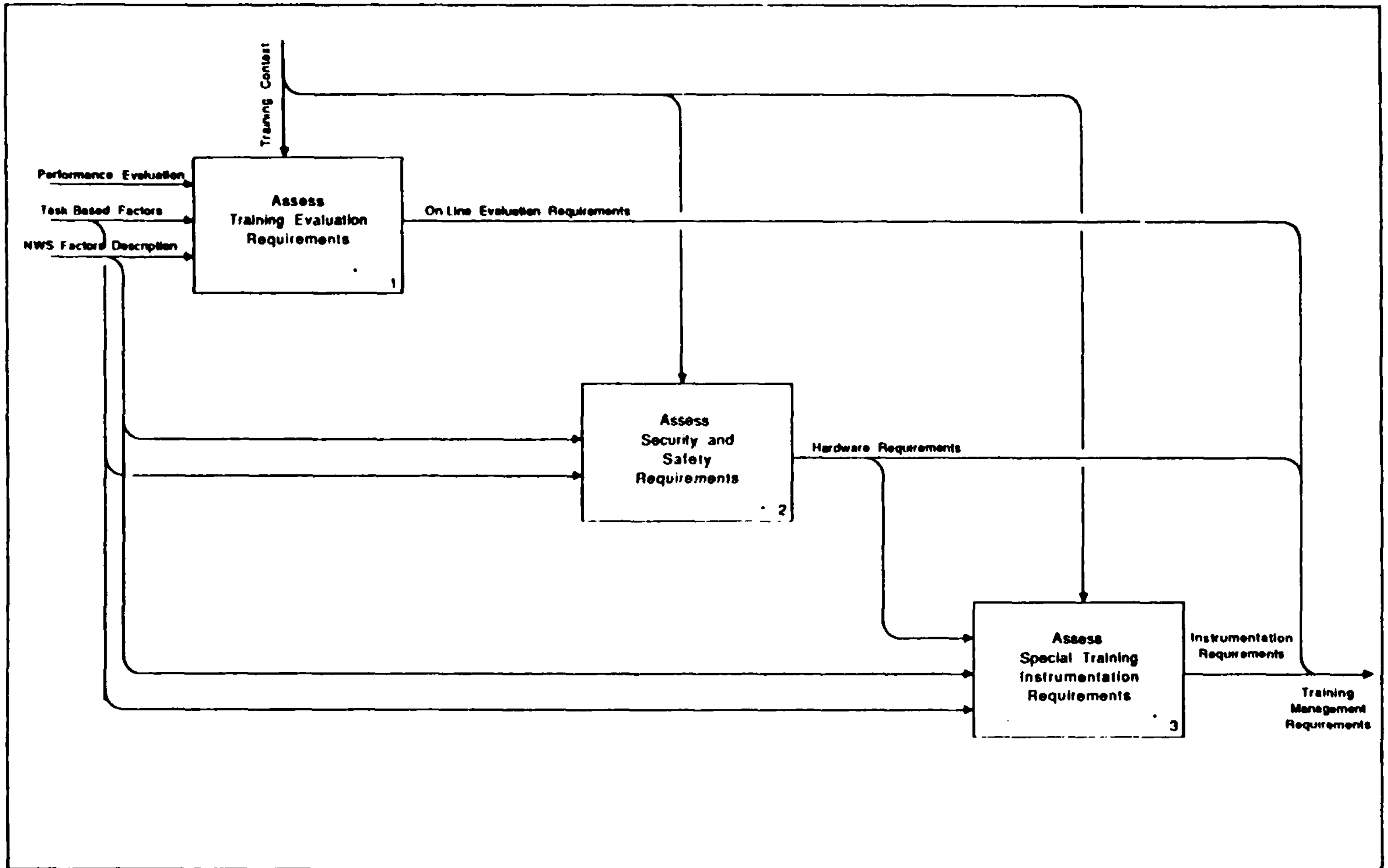

NODE:	TITLE:	NUMBER:
TRASER A011533	Assess Training Management Requirements	

TRASER A011533 ASSESS TRAINING MANAGEMENT REQUIREMENTS

Training management is an aspect of training delivery which considers the mechanisms for training evaluation and instrumentation within the potential ET environment. Training concepts and prime system characteristics, as well as performance evaluation requirements serve as inputs, while the training context is the control. Training evaluation requirements consider the ease of obtaining evaluations in light of the complexity of the tasks, and the ease by which performance can be directly observed or automatically trapped for comparison within the system. The use of additional equipment to support training and the safety and security implications of such equipment are also considered within the training management process. Clearly, the need for networked ET should be identified early, so that appropriate plans and accommodations can be made for the additional instrumentation. The requirements for networked embedded training will be compared against alternative solutions, involving stand alone simulators, or other devices, in later TRASER processes.

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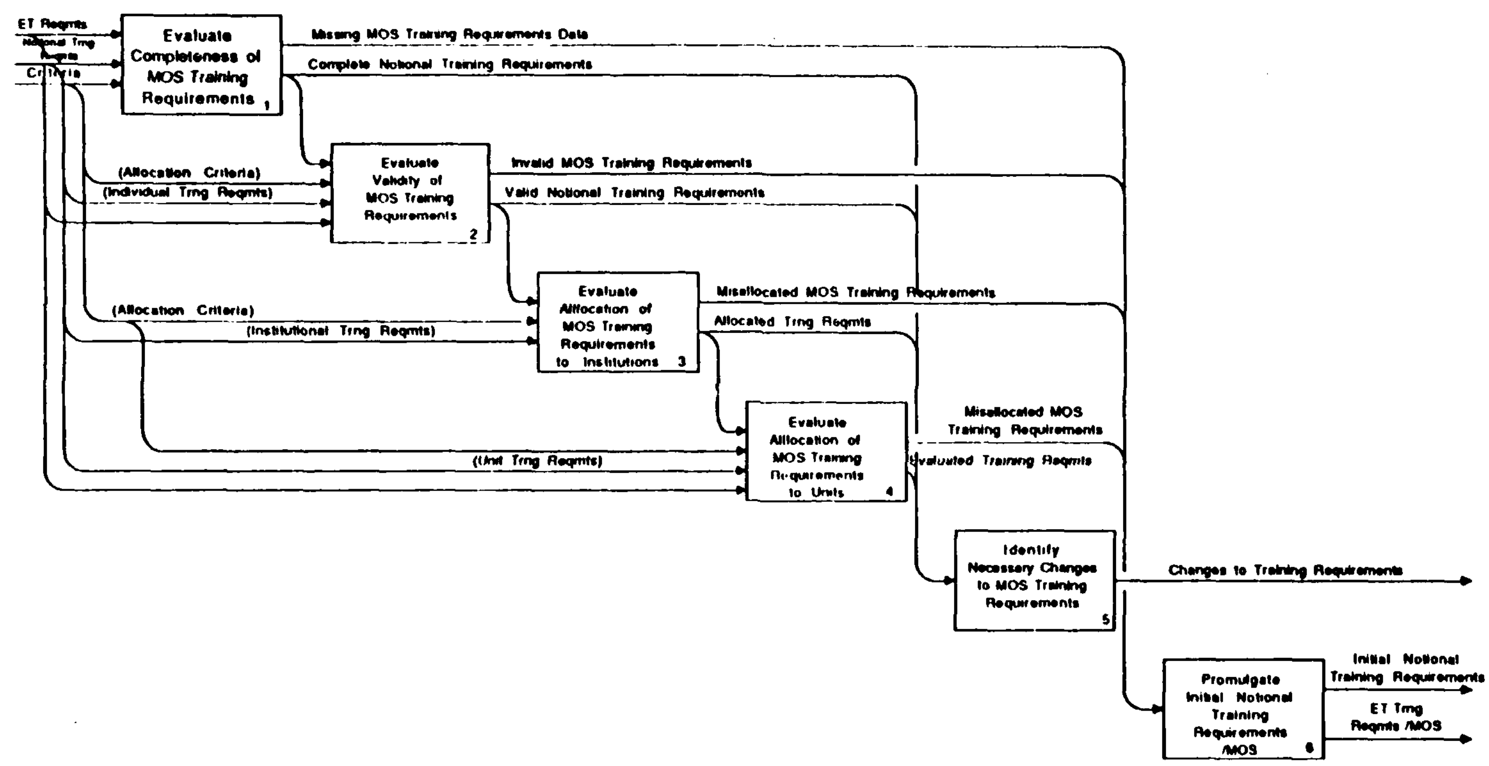

NODE:	TITLE:	NUMBER:
TRASER A0116	Evaluate Notional Training Requirements	

TRASER A0116 EVALUATE NOTIONAL TRAINING REQUIREMENTS

In this portion of the architecture, the training developer must evaluate the entire set of training requirements to ensure that all requirements are valid and complete. In this very early stage of weapon system development, where detailed data are scarce, tentative, changing, incomplete and perhaps only available by historic reference, this activity is crucial and must be repeated often as new data supplants old data.

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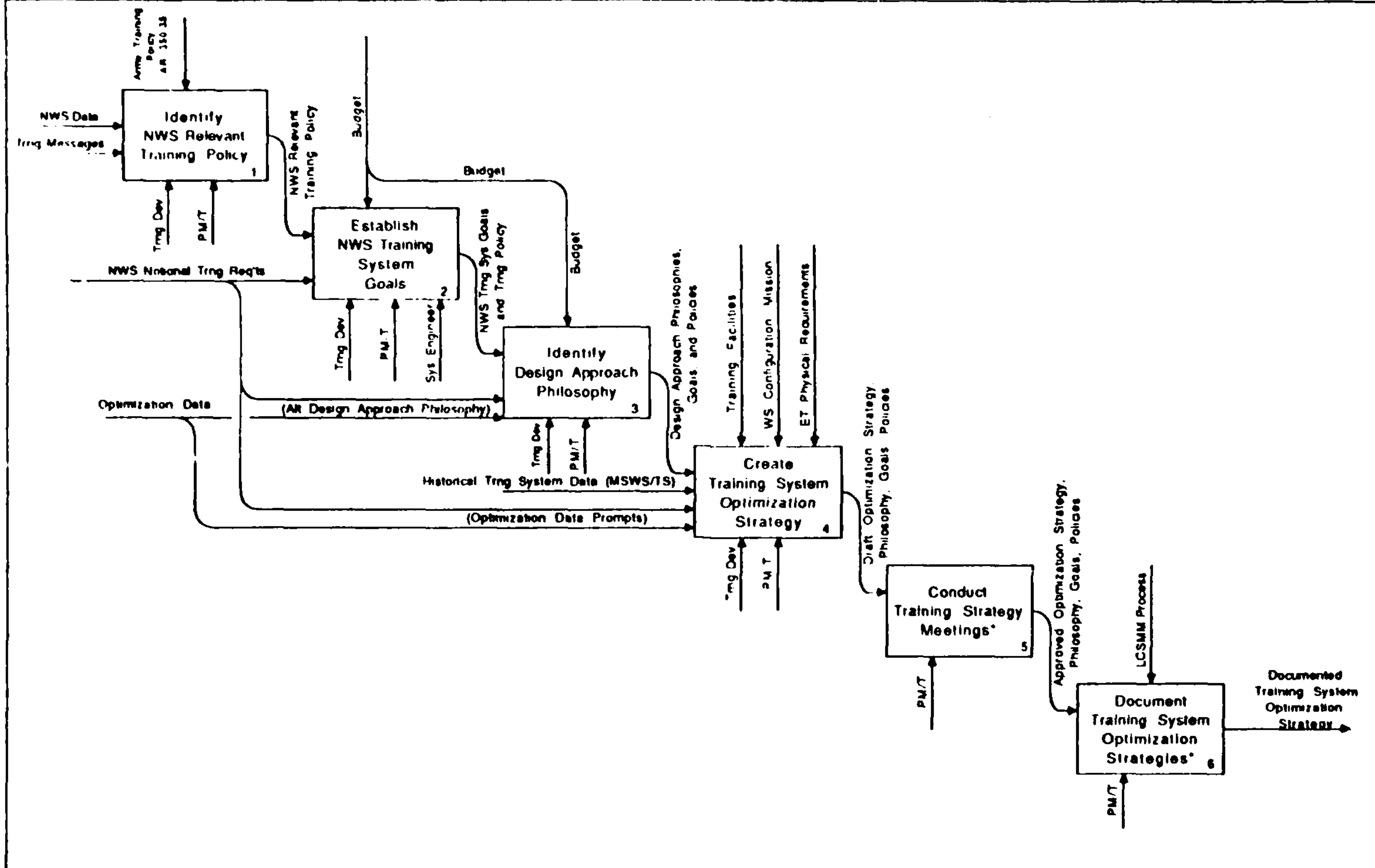

NODE:	TITLE:	NUMBER:
TRASER A012 *	Develop Training System Optimization Strategy	

TRASER A012 DEVELOP TRAINING SYSTEM OPTIMIZATION STRATEGY

In this activity, a strategy or plan is developed which guides the design and development of the training system later in the LCSMM process. The strategy, to be effective, must be rooted in current NWS training policy as well as other factors surrounding the NWS program, such as training budget, available training facilities and urgent training goals. Once these factors are identified, a coherent training design approach philosophy must be selected that will address those factors. For example, if the training budget is low, then a "design to cost philosophy" should be selected as the main design philosophy. Other secondary philosophies can be selected, if required, which optimize the training system along either cost, maximum effectiveness, efficiency, or flexibility lines of optimization. After the design philosophy has been selected, TRASER will offer sets of "design optimization prompts" which the user can apply to various components of the training system. Using the "design to cost" philosophy, prompts such as "off the shelf", low fidelity, simplicity, manual, general purpose, and others would be offered to aid in optimizing along cost guidelines. The result would be a strategy statement that simulators, for example, will be simple low fidelity devices that use off the shelf equipment. Selecting other philosophies would result in different simulator designs. These prompts, along with the design philosophy, are the main ingredients of the strategy which must be documented, reviewed in a training strategy conference, and finalized.

USED AT:	AUTHOR: Fauge	DATE: 1/16/90		WORKING	READER	DATE	CONTEXT:
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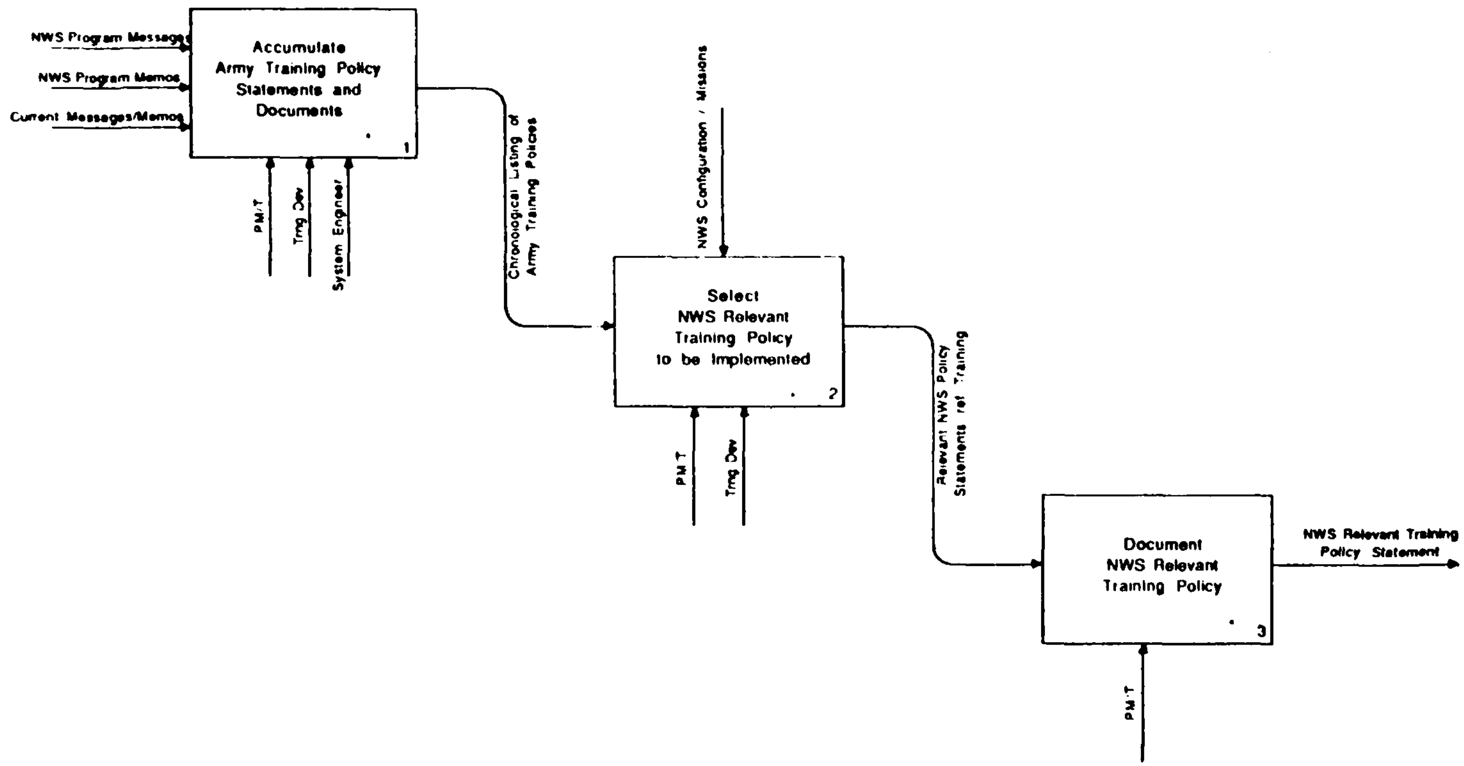

NODE:	TITLE:	NUMBER:
TRASER A0121 •	Identify NWS Relevant Training Policy	

TRASER A0121 IDENTIFY NWS RELEVANT TRAINING POLICY

This activity recognizes that a major factor in a global training system strategy is the training policy issued by Army general officers. These policy statements must be continually accumulated and reviewed for impact on the developing NWS training system. Such policy statements will be found in Army message traffic, memos, and directives issued from various levels of the Army. Relevant policy must be identified, adopted as relevant, and used in forming the training system optimization strategy.

USED AT:	AUTHOR: Feuge	DATE: 1/15/90		WORKING	READER	DATE	CONTEXT:
San Diego	PROJECT: TRASER	REV: 1		DRAFT			A012
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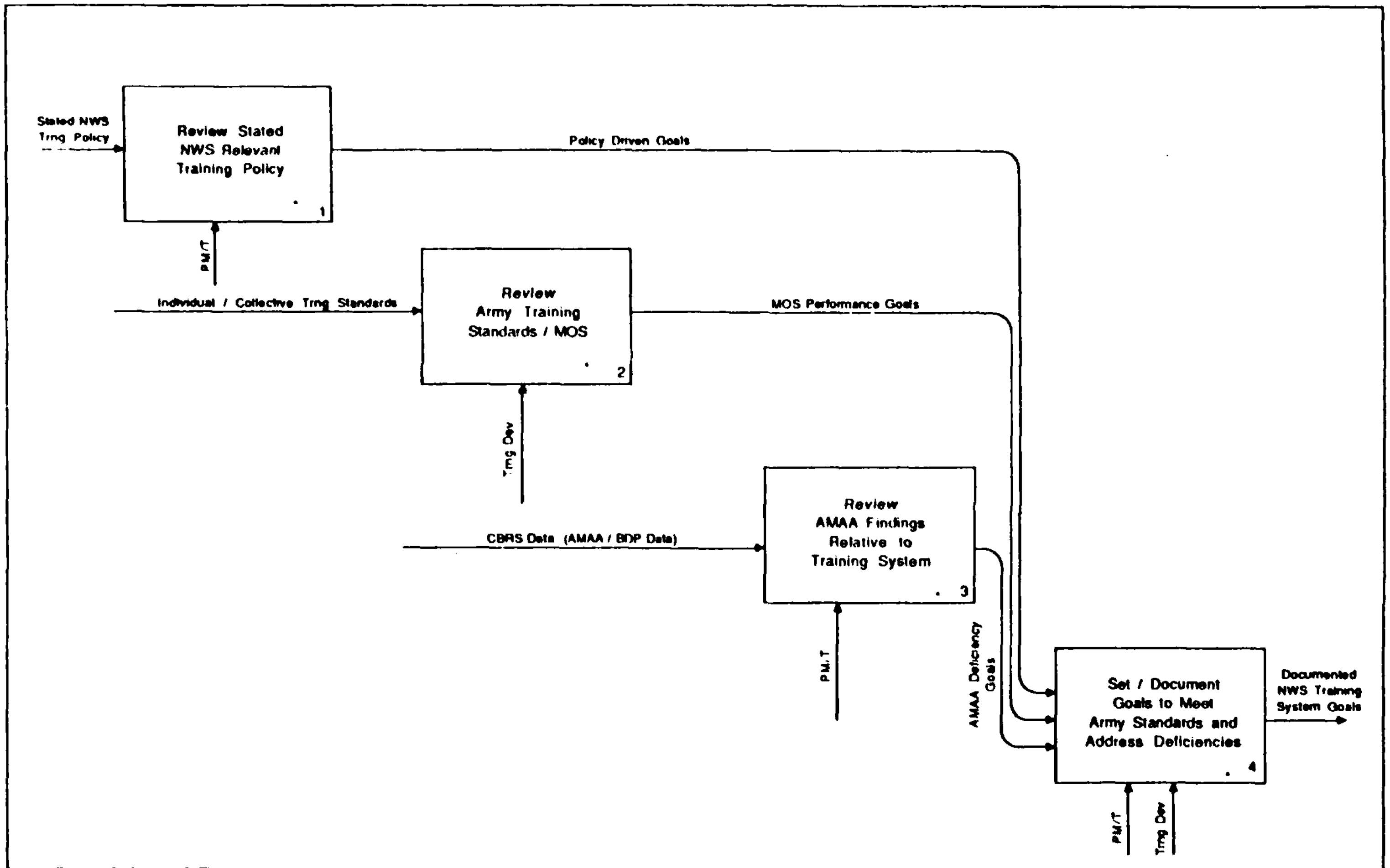

NODE:	TITLE:	NUMBER:
TRASER A0122	Establish NWS Training System Goals	

TRASER A0122 ESTABLISH NWS TRAINING SYSTEM GOALS

Specific goals for the NWS training system must be identified and assessed for impact on the strategy. Training goals will be described in terms of performance levels to be achieved at the institution and unit, and at various levels of training such as initial qualification, refresher, and sustainment levels. Training goals will also be expressed in terms of the structure of the training system, and where training emphasis will be placed in the structure (e.g., emphasize unit training). Goals may also be used to address deficiencies identified in the Mission Area Analysis (MAA) or Battlefield Development Plan (BDP). Thus, a variety of sources can used to generate goals for the NWS training system. These goals from diverse sources must be reconciled and documented for use in the strategy.

USED AT	AUTHOR: Feuge	DATE: 1/16/90		WORKING	READER	DATE	CONTEXT:
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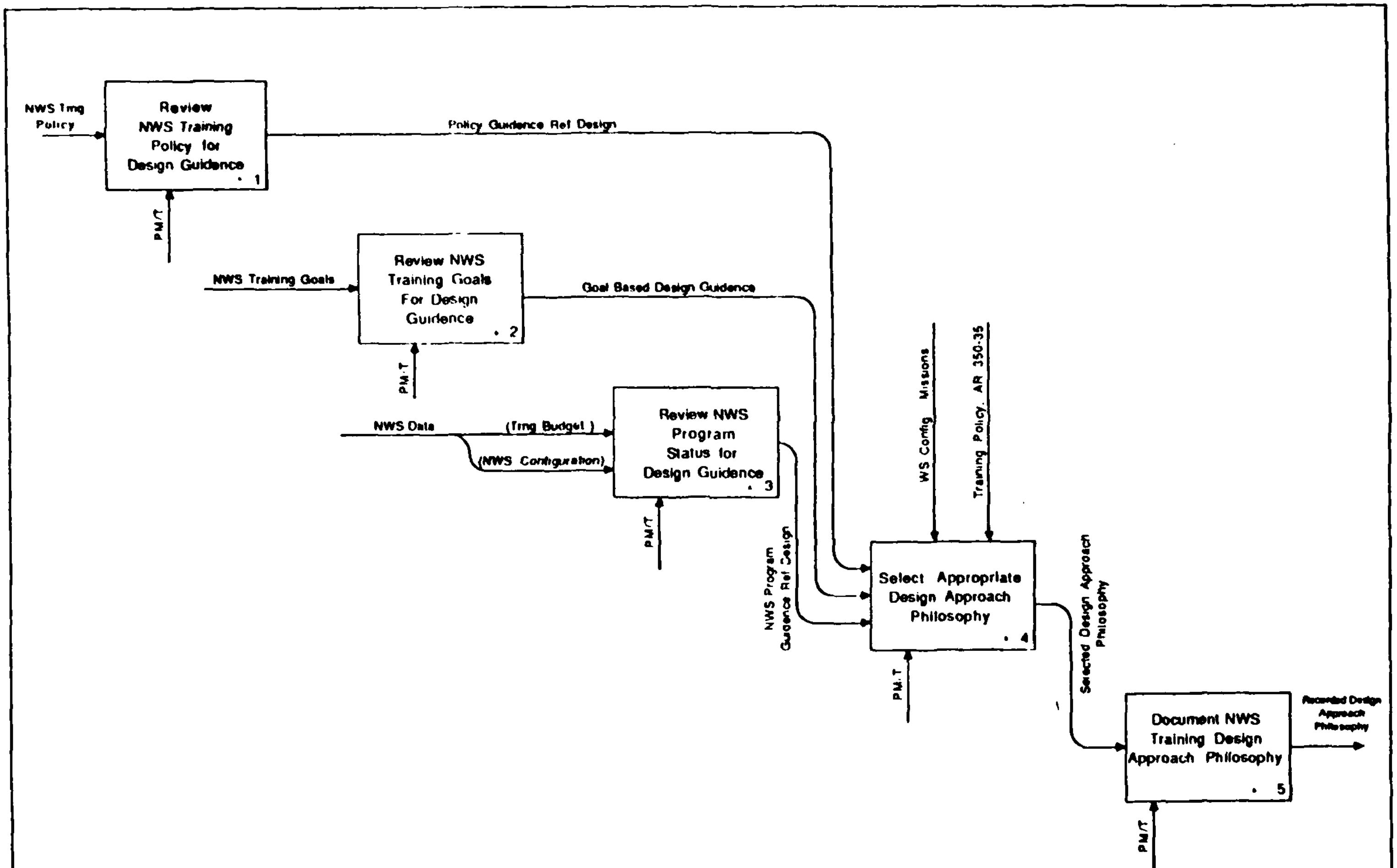
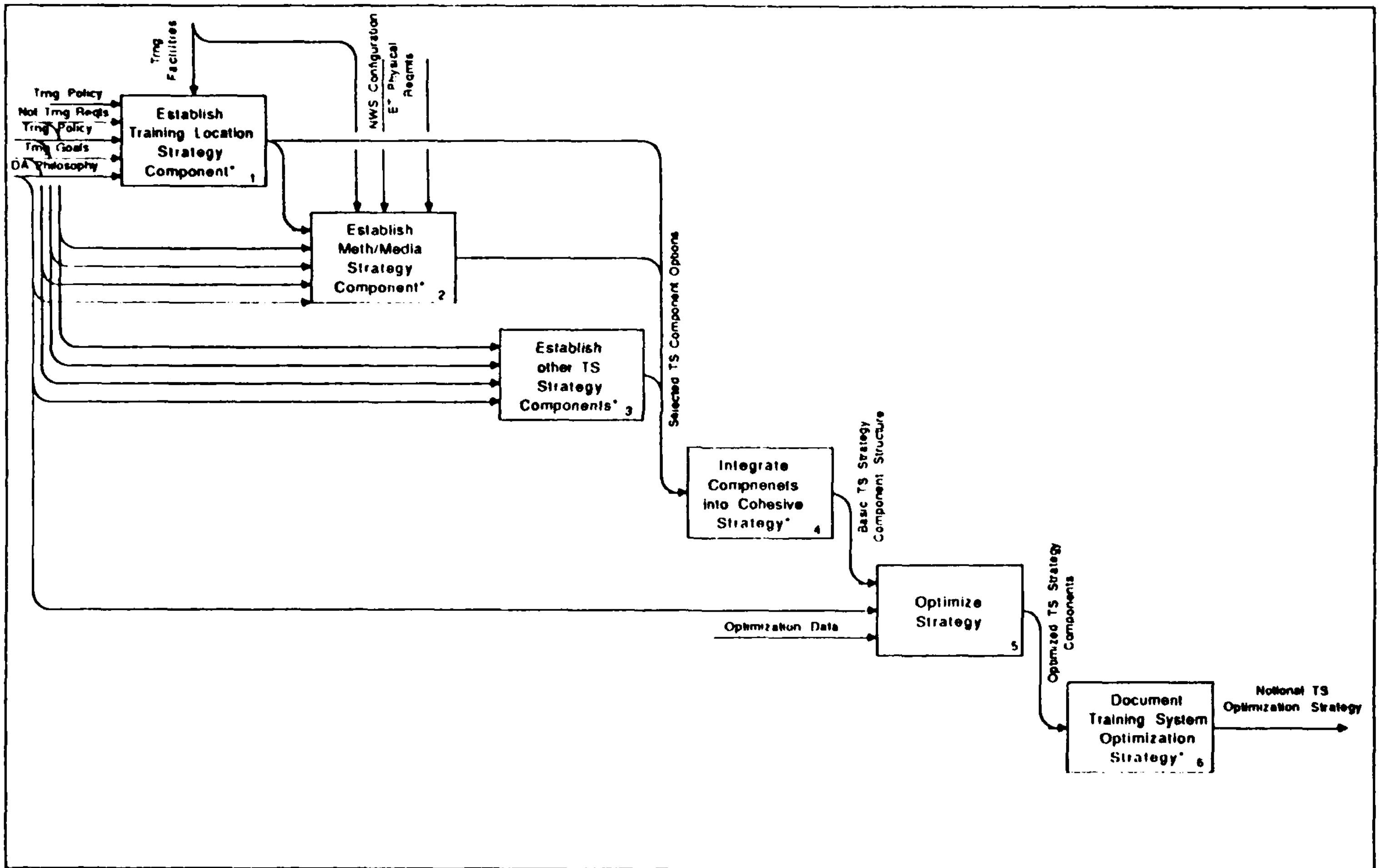


NODE:	TITLE:	NUMBER:
TRASER A0123 •	Identify Design Approach Philosophy (s)	

TRASER A0123 IDENTIFY DESIGN APPROACH PHILOSOPHIES

Training system policy, goals, and NWS program data must be synthesized to determine which components of the NWS training system are to addressed by the training optimization strategy. This synthesis will determine how the training system is to be optimized. TRASER will provide at least five optimization dimensions: cost reduction, maximum effectiveness, efficiency, flexibility, and modernization. The author of the optimization strategy will have to prioritize these dimensions to reflect policy, goals and NWS program factors and select accordingly. The last step is to document the design approach philosophies selected.

USED AT: San Diego	AUTHOR: Feuge PROJECT: TRASER NOTES: 1 2 3 4 5 6 7 8 9 10	DATE: 1/15/90 REV: 2	WORKING DRAFT RECOMMENDED PUBLICATION	READER DATE	CONTEXT: A012



NODE: TRASER A0124*	TITLE: Create Training System Optimization Strategy	NUMBER:

TRASER A0124 CREATE TRAINING SYSTEM OPTIMIZATION STRATEGY

The user(s) creates a multi-faceted training system optimization strategy. Two key facets, or components, of the strategy are "training location emphasis" options and "training method and media emphasis" options. These components allow the user to skew emphasis in the training system design in accordance with existing training policy, training goals, and design approach philosophies. Examples are to "emphasize unit training (as opposed to institution) and "intensify simulator applications. When the basic components of the strategy have been selected, the design approach prompts are identified and applied to the components of the strategy. For example, if a "simulator intensive" component has been selected, design approach prompts (such as moveable or reconfigurable) would be applied to the strategy for simulators and to simulator design in A013 (DESIGN INITIAL NOTIONAL INTEGRATED TRAINING SYSTEM). The last step is to document the optimization strategy.

USED AT:	AUTHOR: Feuge	DATE: 1/15/90		WORKING	READER	DATE	CONTEXT:
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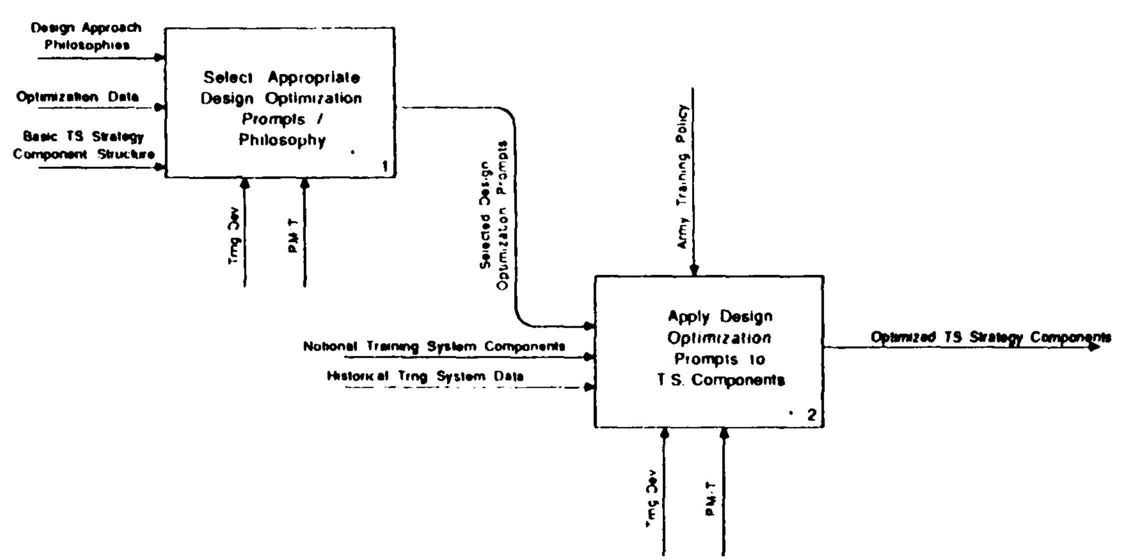

NODE:	TITLE:	NUMBER:
TRASER A01245 •	Optimize Strategy	

TRASER A01245 OPTIMIZE STRATEGY

The selected design approach philosophies are used to retrieve from TRASER databases design optimization prompts that, when applied to training system components, will help achieve optimization along the lines of the design approach philosophy. Such optimization will applied to all training requirements for the entire integrated training system and documented for subsequent use in designing the training system.

USED AT:	AUTHOR: Feuge	DATE: 1/16/90	WORKING	READER	DATE	CONTEXT:
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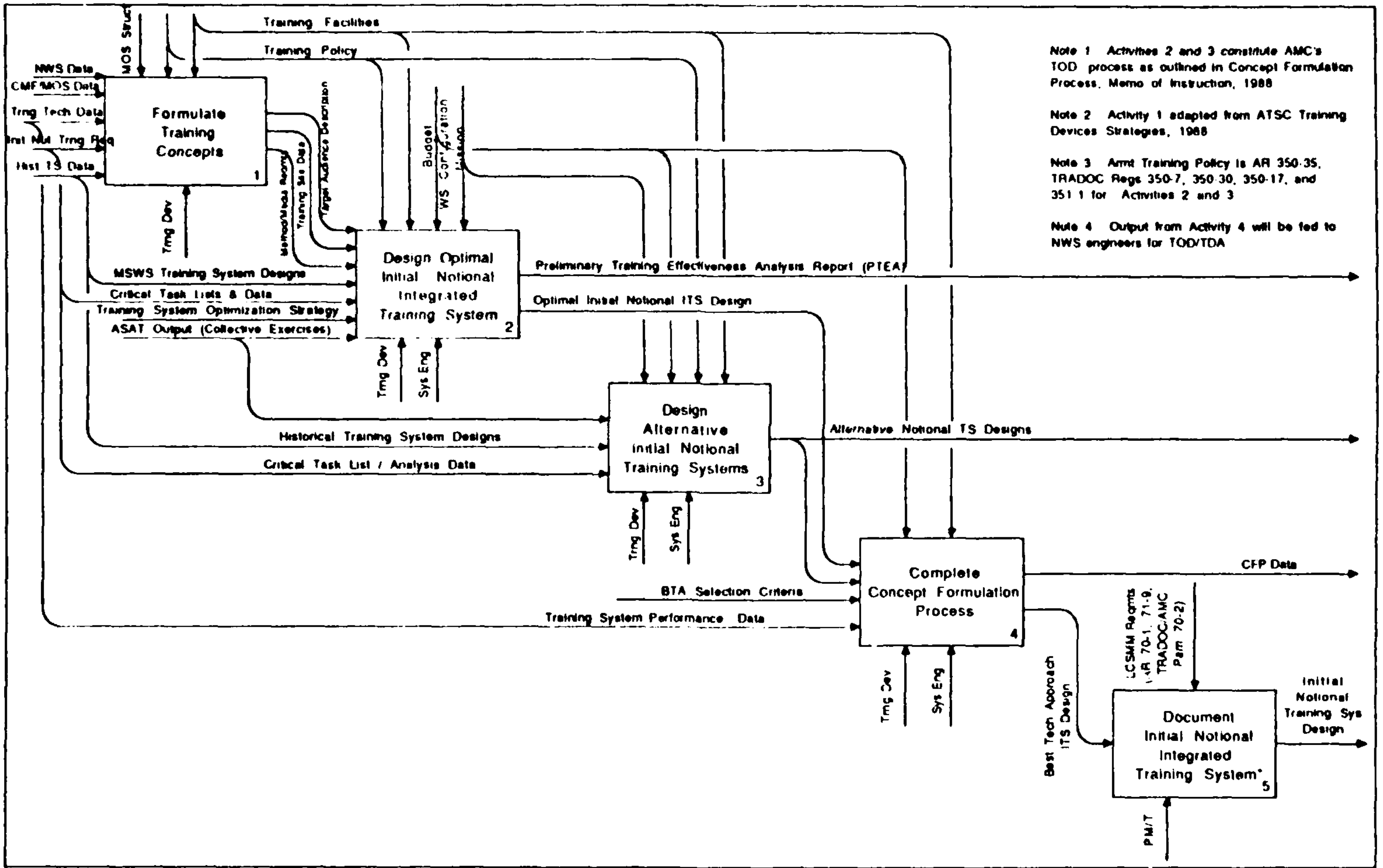

NODE:	TITLE:	NUMBER:
TRASER A013	Design Initial Notional Integrated Training System	

TRASER A013 DESIGN INITIAL NOTIONAL INTEGRATED TRAINING SYSTEM

The basic method for approaching the Concept Exploration Phase of LCSMM, as required by AR 70-19, is covered in five activities. At the outset, training concepts must be established, based on facts about the target audience(s), training to be conducted, and the training sites. In activities 2 and 3, alternative designs for the ITS are created, using the Training System Optimization Strategy from A012. These steps cover the TOD process which is AMC's responsibility. After TOD, a TOA and BTA selection are performed as part of the Concept Formulation Process (CFP). The last step is to document the CFP process, describing the BTA ITS design in detail. In A014, (ELEVATE INITIAL NOTIONAL TRAINING SYSTEMS DESIGN) the CFP process will be completed by conducting a CTEA.

USED AT:	AUTHOR: Feuge	DATE: 1/15/90		WORKING	READER	DATE	CONTEXT:
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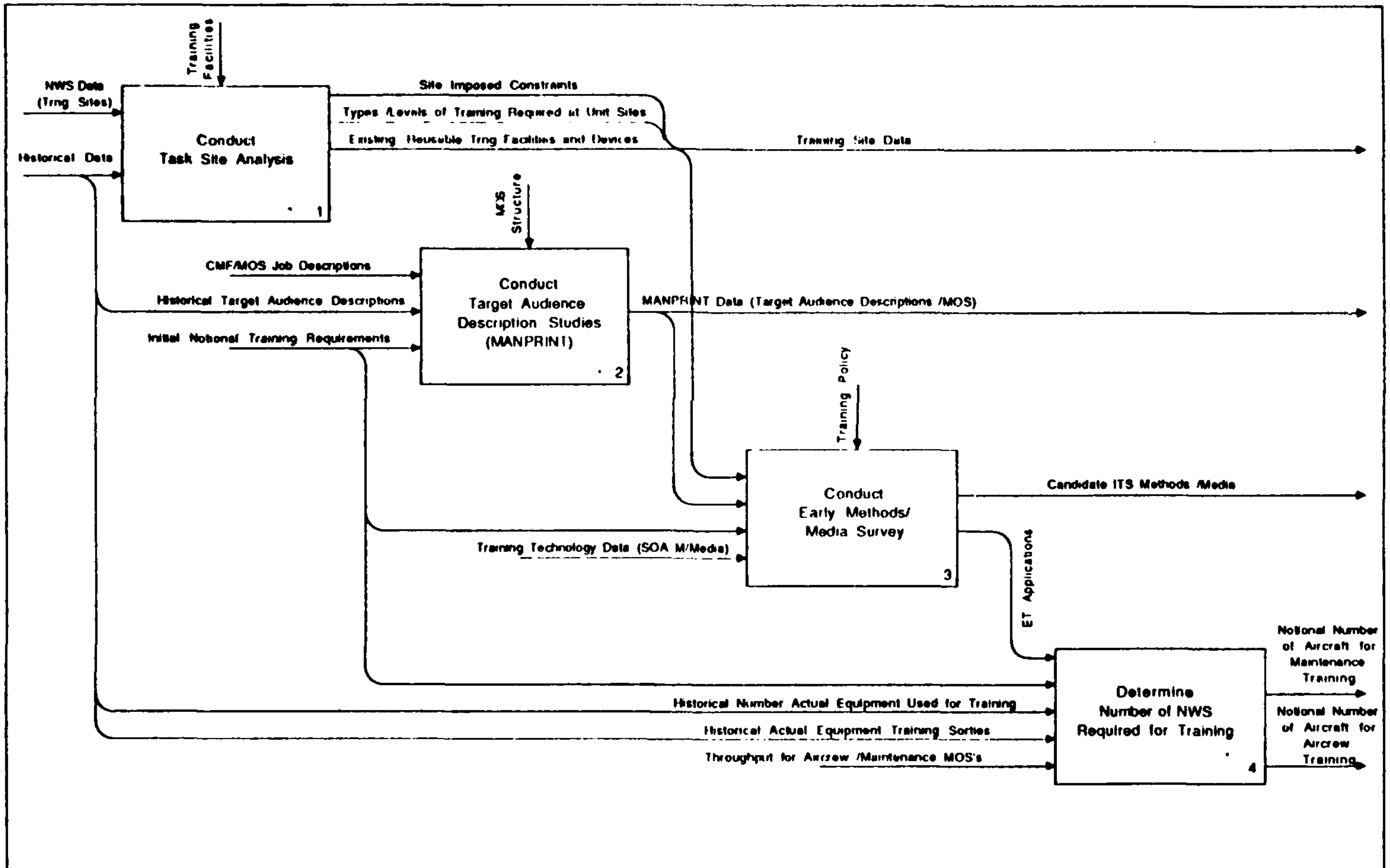

NODE:	TITLE:	NUMBER:
TRASER A0131	Formulate Training Concept	

TRASER A0131 FORMULATE TRAINING CONCEPTS

This activity is largely adapted from the ATSC document, Training Device Strategies. In its most useful form, this process amounts to conducting a problem analysis on the training sites which will receive the new NWS ITS. The various training sites, identified in A011, (GENERATE NOTIONAL TRAINING REQUIREMENTS) are reviewed to find major constraints that will limit or alter the design of the ITS, such as environmental factors. Also, types and levels of training to be conducted at each site are loosely determined, pending further analysis. Reuseable assets are also identified. The target audience characteristics are established (or reviewed, if they already exist) to determine treatment by aptitude interactions. Based on the site surveys and the target audience, an estimate of probable method and media required at each site is made and carried forward as the training concept, along with the estimates of training devices made in A012 (DEVELOP TRAINING SYSTEM OPTIMIZATION STRATEGY). This step is refined later in A01322 (DESIGN OPTIMAL COURSES AND EXERCISES FOR MOS) and A01323 (DESIGN OPTIMAL METHOD/MEDIA FOR MOS COURSES).

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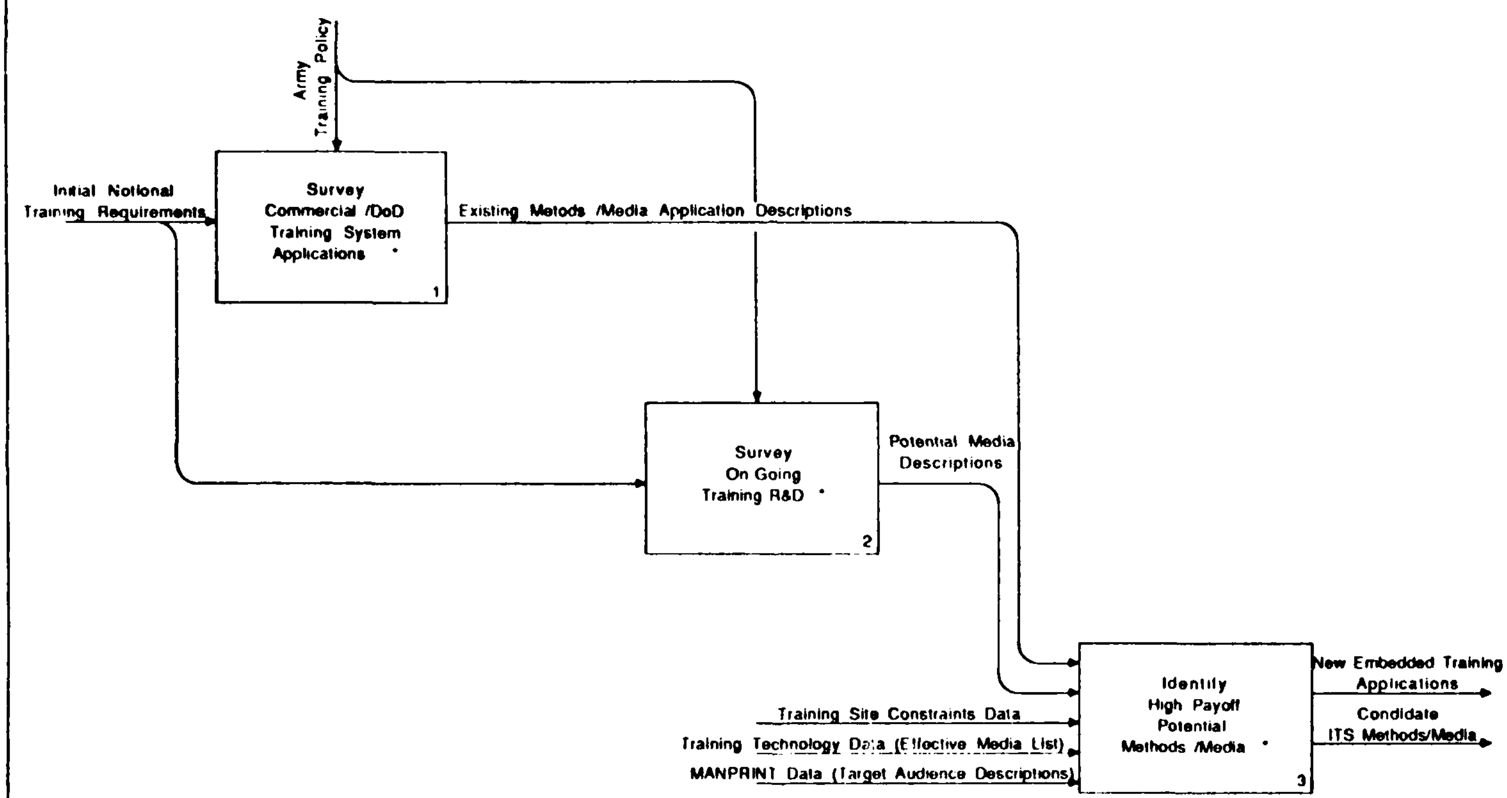
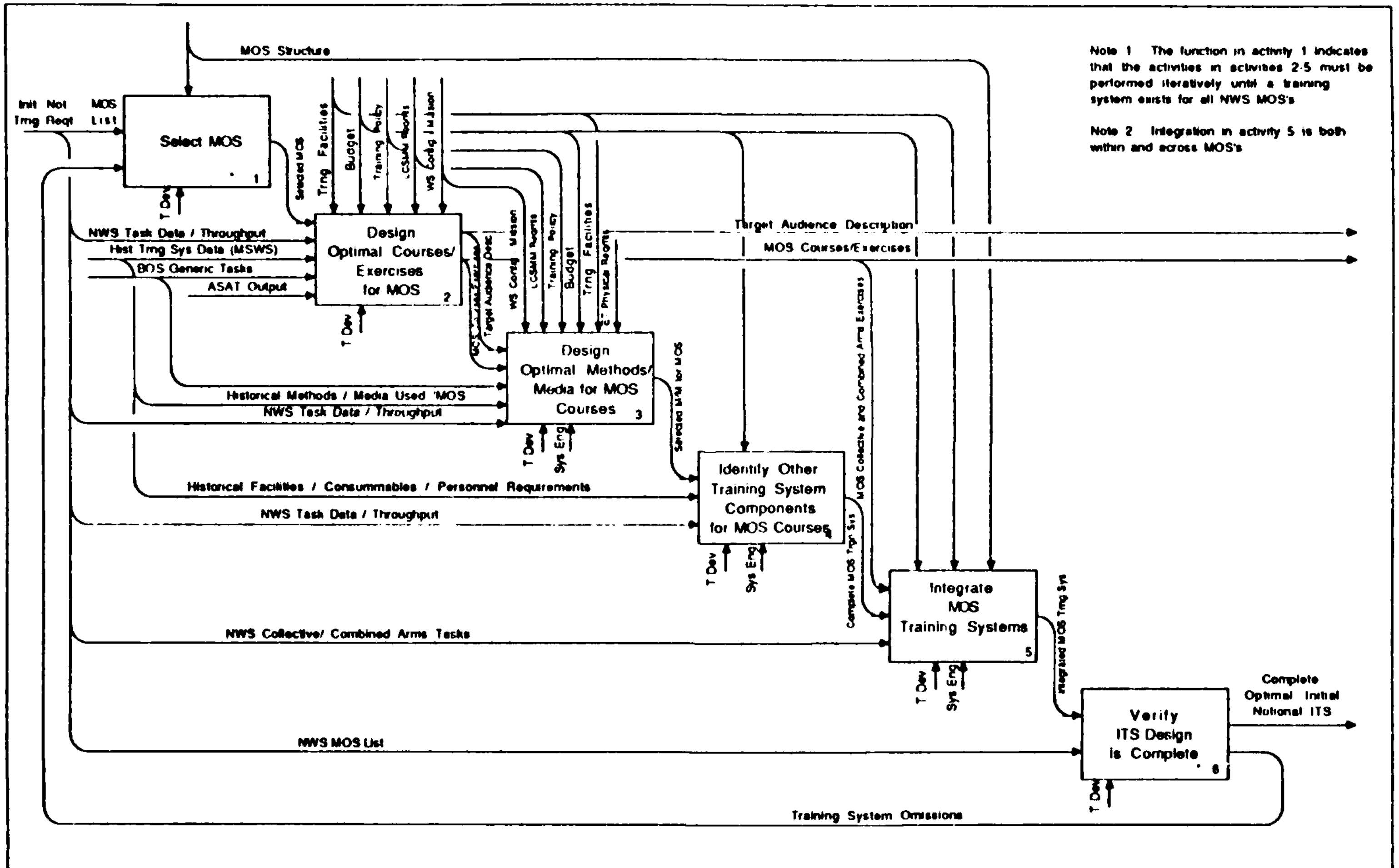


NODE:	TITLE:	NUMBER:
TRASER A01313*	Conduct Early Methods /Media Survey	

TRASER A01313 CONDUCT EARLY METHODS AND MEDIA SURVEY

This activity leads to the identification of potential high payoff, new methods and media. Surveys of commercial training applications and research and development activities are inputs to identification of new embedded training applications and other new candidate methods and media.

USED AT: San Diego	AUTHOR: Feuge PROJECT: TRASER NOTES: 1 2 3 4 5 6 7 8 9 10	DATE: 1/16/90 REV: 2	WORKING DRAFT RECOMMENDED PUBLICATION	READER	DATE	CONTEXT: A013



NODE: TRASER A0132	TITLE: Design Optimal Notional Integrated Training System	NUMBER:

MOSs are iteratively selected and an optimal, unique training system is designed for each, using the TRASER unique definition of a training system. The design process involves application of the design optimization prompts from the Training System Optimization Strategy to each element of the training system; namely, courses, exercises, methods and media, consummables, personnel, performance measurement systems, and documentation. These prompts help orient the design towards the design approach philosophy that the training developer selected in A012 (DEVELOP TRAINING SYSTEM OPTIMIZATION STRATEGY). To ensure that collective training is fully supported, MOSs that interact are identified and their training systems are integrated. As an example, integration of pilot and gunner MOSs would require a design to allow position trainers to interact in mission exercises. The last step is to verify that all MOS training systems have been designed and integrated.

USED AT:	AUTHOR: Feuge	DATE: 1/16/90		WORKING	READER	DATE	CONTEXT:
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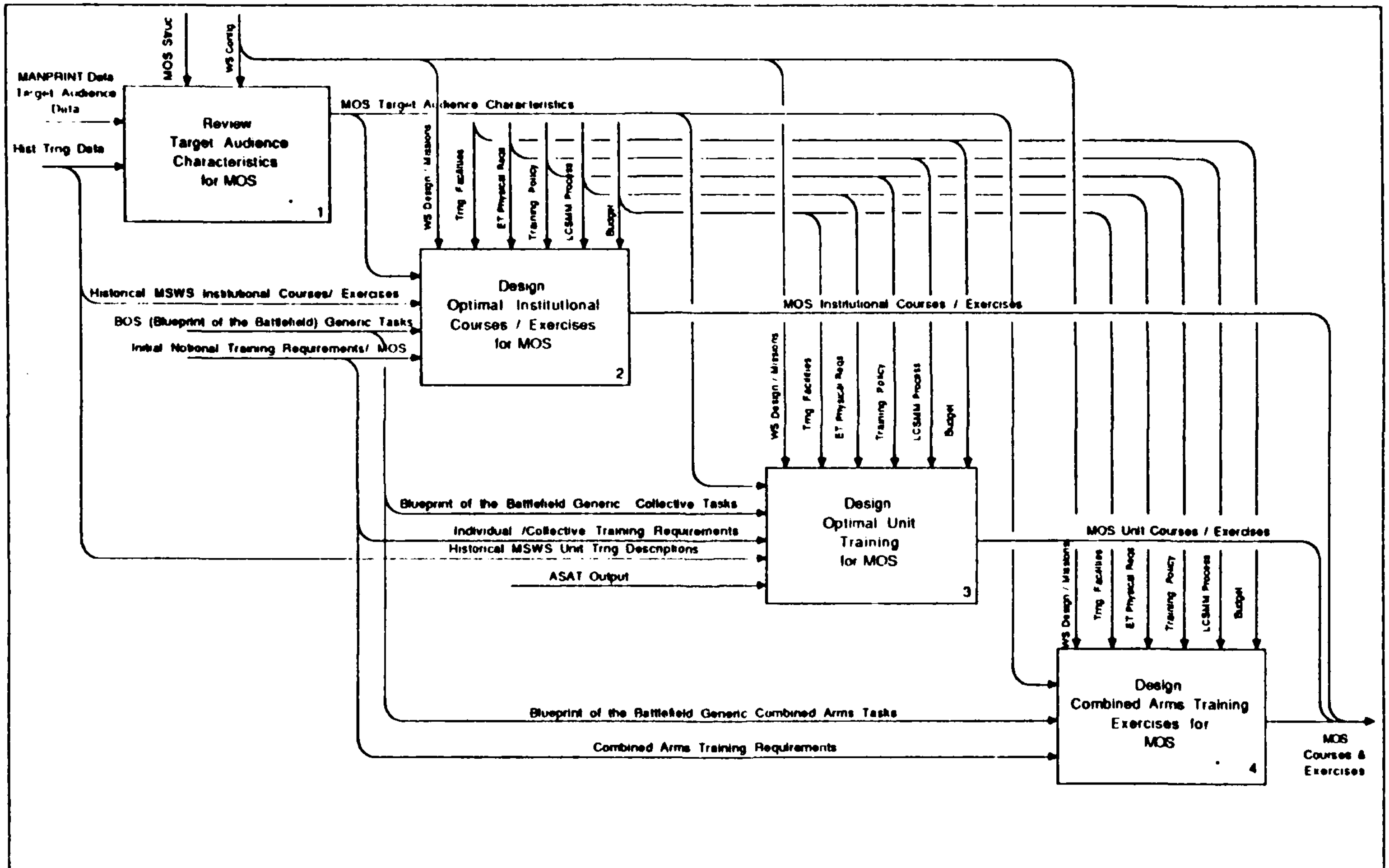

NODE:	TITLE:	NUMBER:
TRASER A01322	Design Optimal Courses and Exercises for MOS	

TRASER A01322 DESIGN OPTIMAL COURSES AND EXERCISES FOR MOS

In this activity, the basic courses and exercises for each MOS are designed. In some cases, all new courses and exercises will be designed. In other cases (e.g., maintenance training), courses will be modified to include NWS content. This effort encompasses the entire MOS "pipeline", including Institution and unit training. Institutional courses and exercises are to provide for individual and limited collective training while unit training will concentrate on collective, integration, and combined arms training. To ensure that individual skills are maintained, sustainment training sessions are designed into unit training. ASAT output is relied upon to design collective training exercises as part of this step.

USED AT:	AUTHOR: Feuge	DATE: 1/16/90		WORKING	READER	DATE	CONTEXT:
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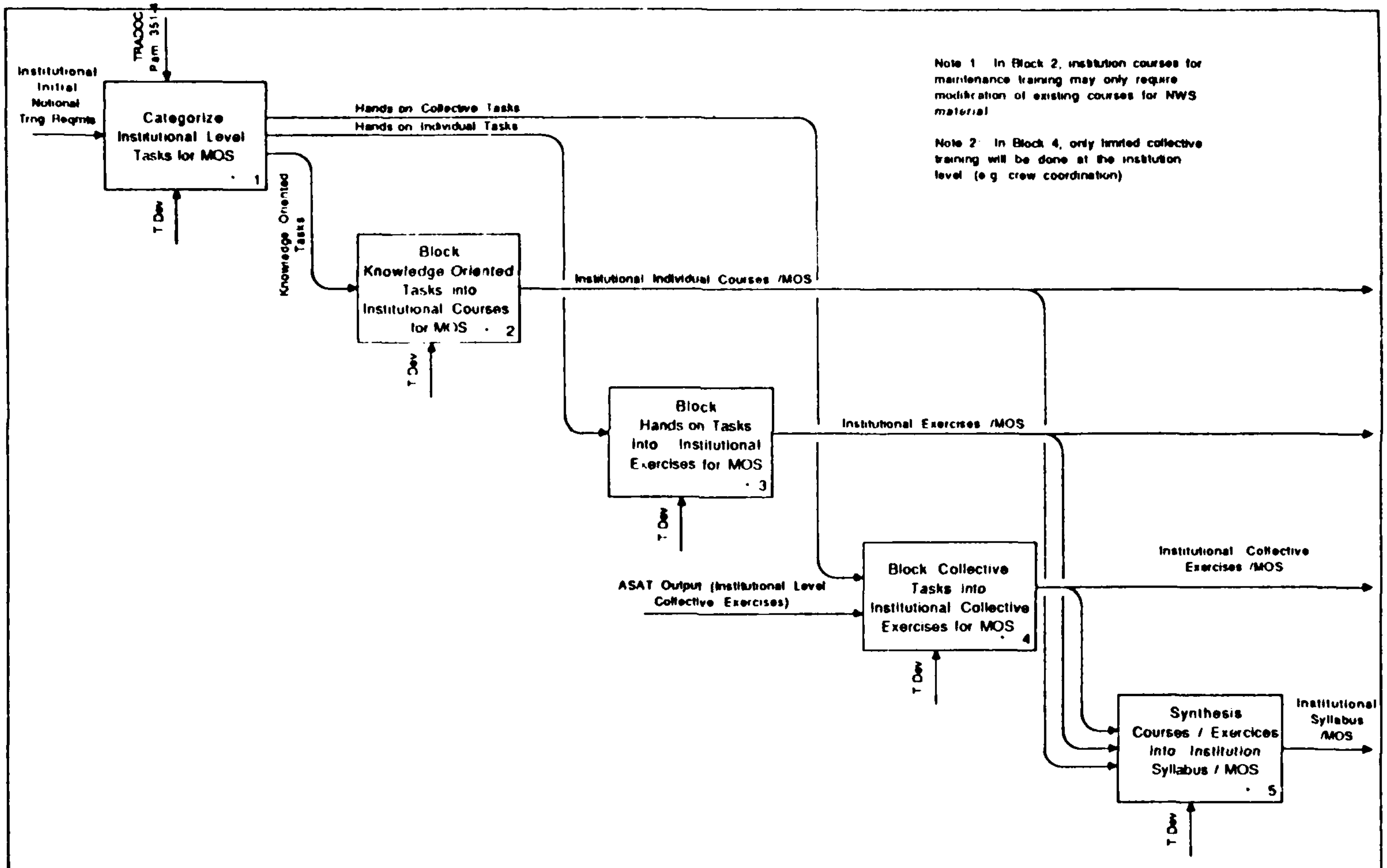
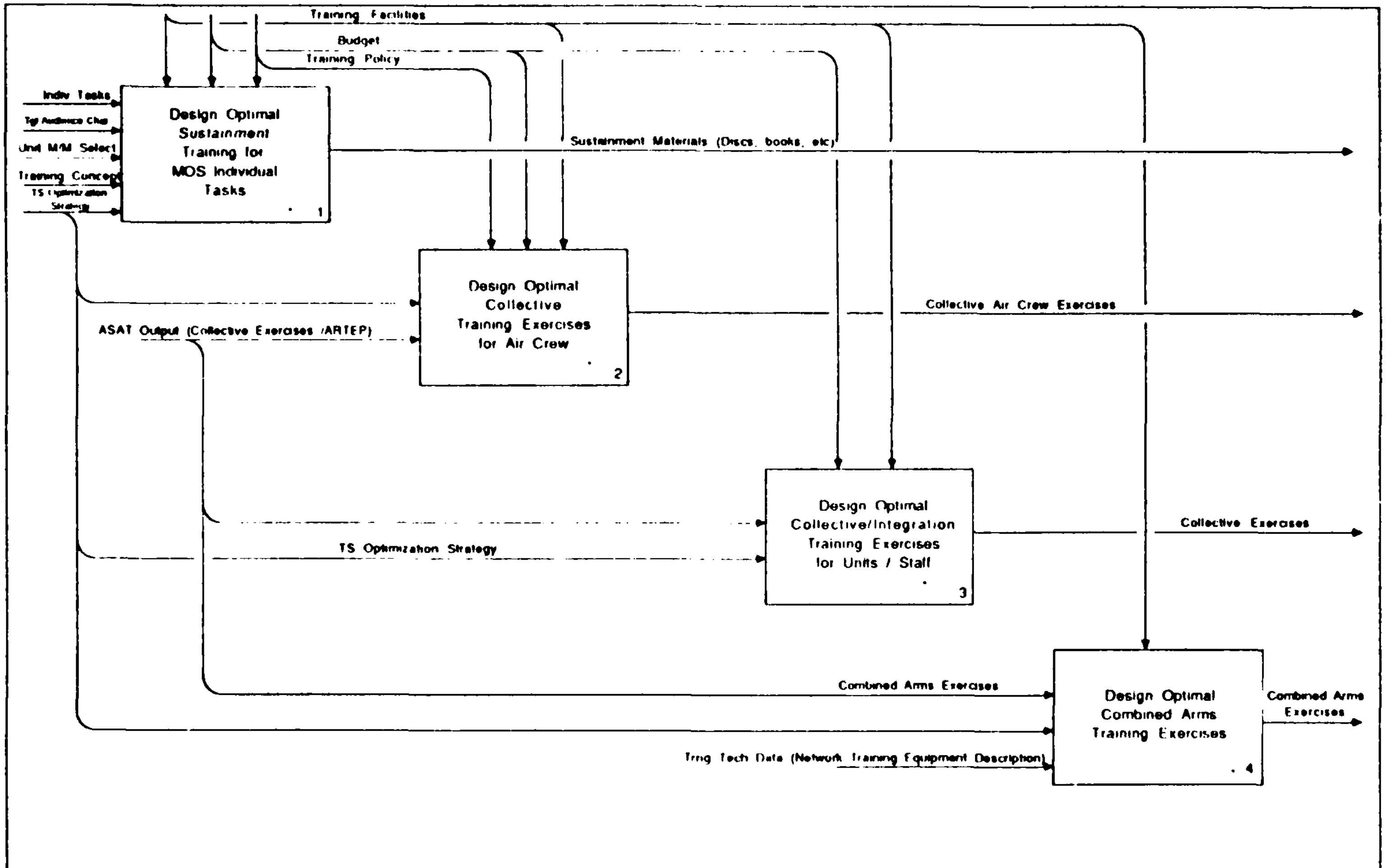


NODE:	TITLE:	NUMBER:
TRASER A013222	Design Optimal Institutional Courses / Exercises for MOS	

TRASER A013222 DESIGN OPTIMAL INSTITUTIONAL COURSES AND EXERCISES FOR MOS

The basic steps of the SAT process are used to create MOS courses and exercises. For the limited collective exercises at the institution, ASAT output will be used to assist in defining collective exercises for MOSs.

USED AT: San Diego	AUTHOR: Feuge PROJECT: TRASER NOTES: 1 2 3 4 5 6 7 8 9 10	DATE: 1/16/90 REV: 1		WORKING DRAFT RECOMMENDED PUBLICATION	READER	DATE	CONTEXT: A01322



NODE: TRASER A013223	TITLE: Design Optimal Unit Training for MOS	NUMBER:

TRASER A013223 DESIGN OPTIMAL UNIT TRAINING FOR MOS

Training for the unit must be identified and designed. Unit training includes sustainment training for MOS individual tasks as well as a series of exercises to teach collective, integration, and combined arms tasks. Care must be taken to ensure that all critical tasks are trained and sustained at the unit level.

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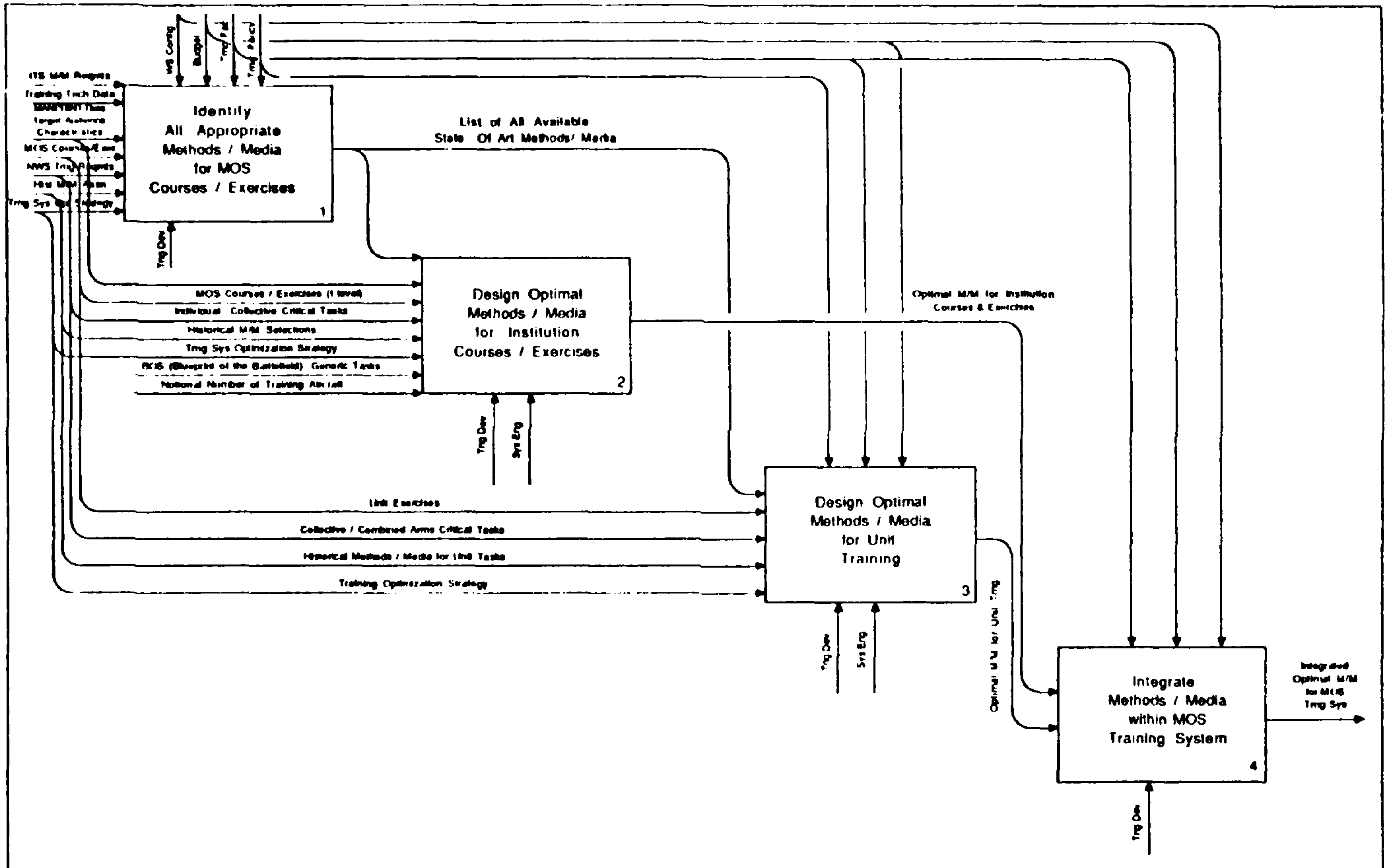

NODE:	TITLE:	NUMBER:
TRASER A01323	Design Optimal Methods / Media for MOS Courses	

TRASER A01323 DESIGN OPTIMAL METHODS AND MEDIA FOR MOS COURSES

In this activity, the Training System Optimization Strategy is used to identify, select and create a high-level design of methods and media required to conduct the MOS courses and exercises at the institution and unit levels. In identifying and designing the methods and media, the training developer will have at his disposal the methods and media (and their design) used in historical training systems as well as a TRASER-unique method for selecting and designing training media. Design in this context does not refer to engineering design but more to conceptual design of the form and function of the media. The last step in this process is to integrate the methods and media within the MOS training system to eliminate costly redundancies or omissions within the pipeline.

USFD AT:	AUTHOR: Feuge	DATE: 1/16/90		WORKING	READER	DATE	CONTEXT:
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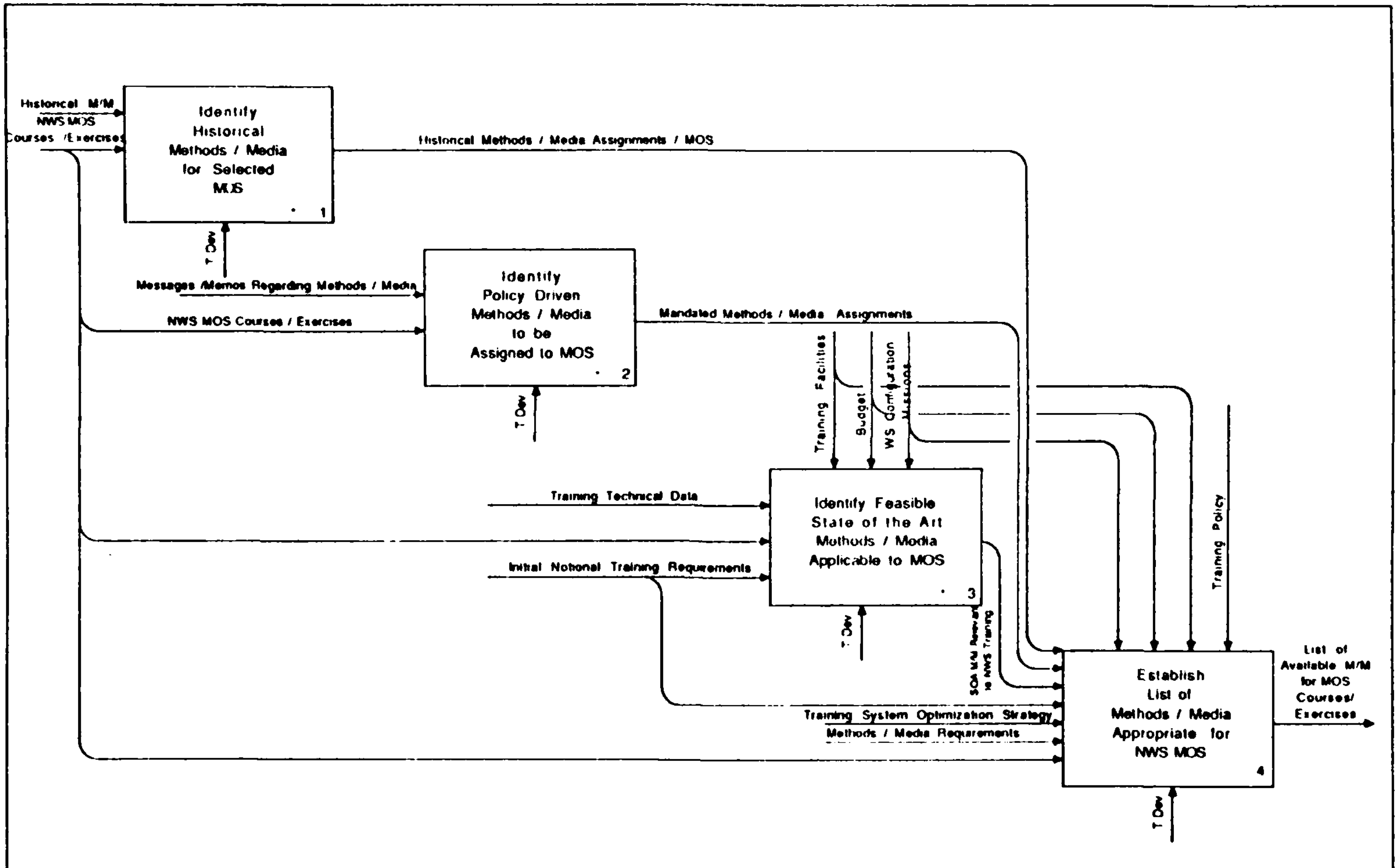

NODE: TRASER A013231

TITLE: Identify All Appropriate Methods / Media for MOS Courses/Exercises

NUMBER:

TRASER A013231 IDENTIFY ALL APPROPRIATE METHODS AND MEDIA FOR MOS COURSES AND EXERCISES

In this activity, a variety of sources are used to create a large pool of potential methods and media from which appropriate methods and media for the NWS ITS are drawn. Sources include historical training system data from TRASER databases, policy-driven media decisions, and state-of-the-art (SOA) media from TRASER databases and other sources. From this pool, the training developer will select a subset that is consistent with the Training System Optimization Strategy and method and media requirements in the training concept. (A0131, FORMULATE TRAINING CONCEPT).

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San Diego	PROJECT: TRASER	REV: 1	DRAFT			A013231
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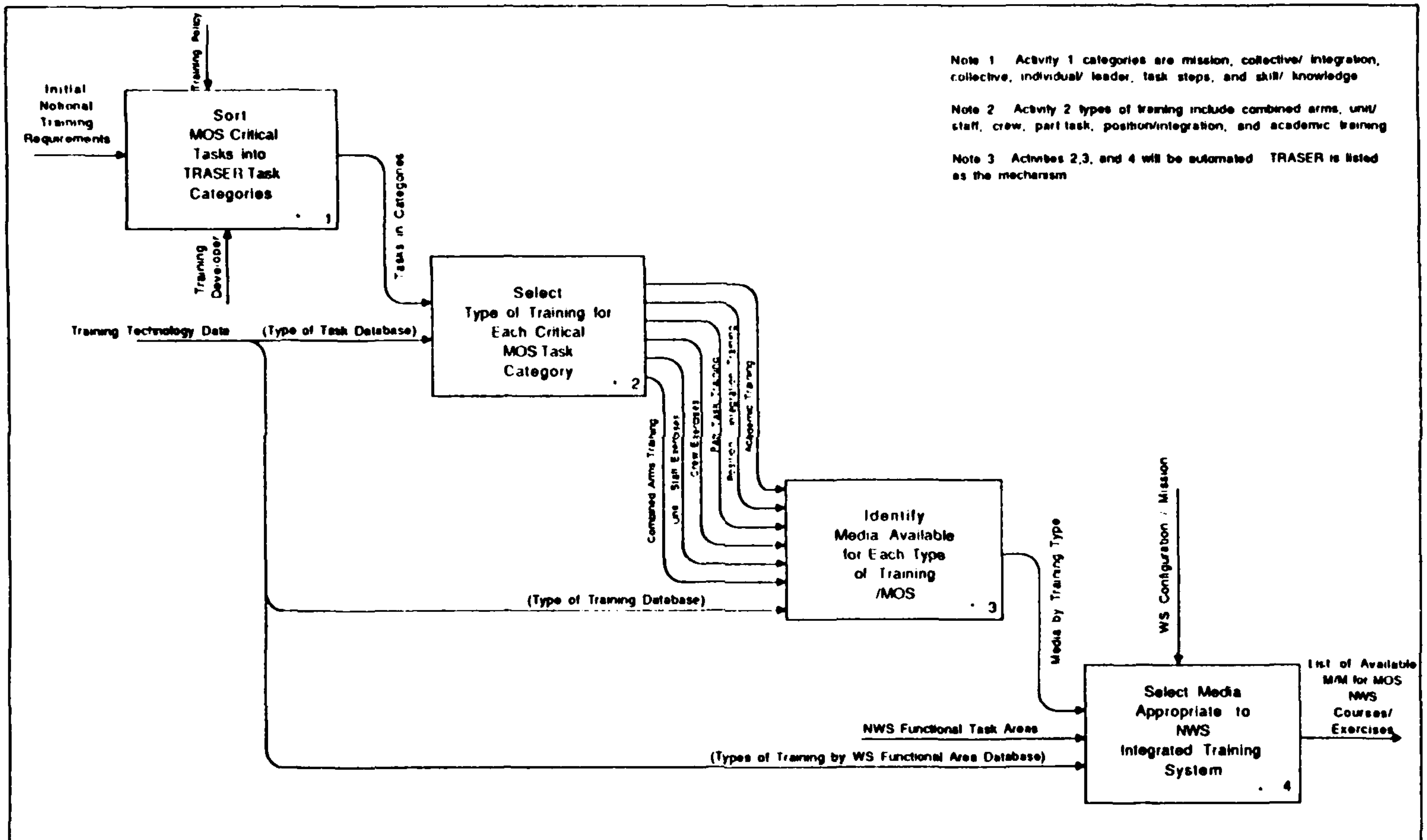
Note 1 Activity 1 categories are mission, collective/ integration, collective, individual/ leader, task steps, and skill/ knowledge

Note 2 Activity 2 types of training include combined arms, unit/ staff, crew, part task, position/integration, and academic training

Note 3 Activities 2,3, and 4 will be automated TRASER is listed as the mechanism



NODE:	TITLE:	NUMBER:
TRASER A0132314*	Establish List of Appropriate Methods / Media for MOS	

TRASER A0132314 ESTABLISH LIST OF APPROPRIATE METHODS AND MEDIA FOR MOS

MOS critical tasks are filtered through a TRASER unique system to select appropriate methods and media for the NWS ITS. In the first step, the user must separate the MOS critical tasks into six categories, ranging from mission tasks (top level) to task steps (lowest level). This categorization helps ensure a "top down" approach to training development. In subsequent steps, TRASER will automatically select the type of training associated with each category of task and also select alternative sets of methods and media for each category. For example, mission tasks are associated with combined-arms training which, in turn, can be trained in the actual weapon system or "network" simulators such as AIRNET or SIMNET. In the last step, functional areas of the NWS are used to select only those methods and media that are relevant to the type of NWS being developed (e.g., gunner trainers would only be selected for attack helicopters, never cargo or utility helicopters).

USED AT:	AUTHOR: Feuge	DATE: 1/16/90		WORKING	READER	DATE	CONTEXT:
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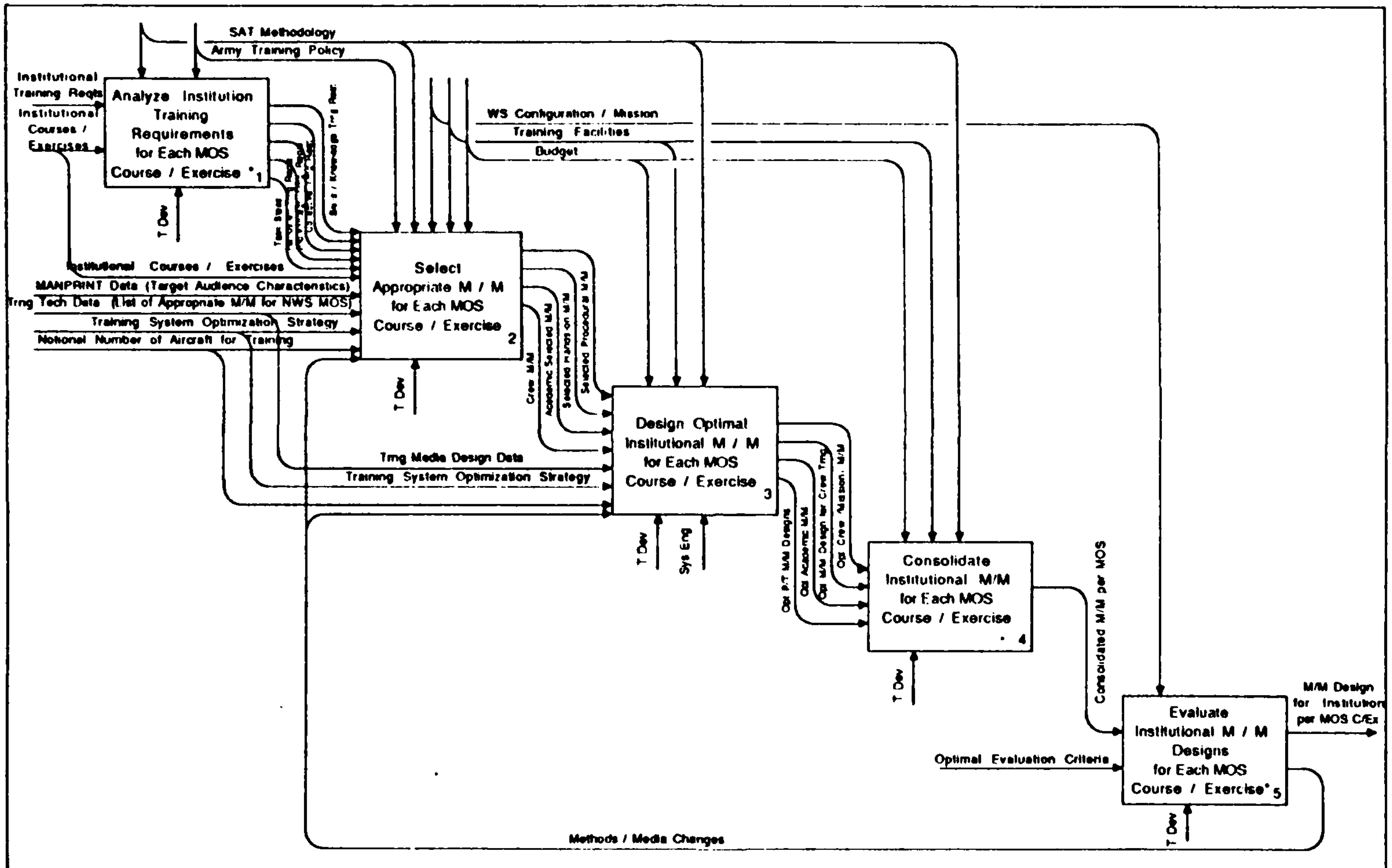

NODE:	TITLE:	NUMBER:
TRASER A013232	Design Optimal Methods / Media for MOS Institution Courses / Exercises	

TRASER A013232 DESIGN OPTIMAL METHODS AND MEDIA FOR MOS INSTITUTION COURSES AND EXERCISES

Appropriate methods and media identified in the previous activity are narrowed to deal only with institution methods and media. Here, specific media are selected and designed for MOS institution-level training. In subsequent steps, selected media selection are consolidated to minimize the number of different media that must be developed and supported for the ITS. In a final step, the methods and media designs are evaluated against optimization criteria to ensure that the ITS design is truly optimal.

USED AT:	AUTHOR: Feuge	DATE: 1/16/90		WORKING	READER	DATE	CONTEXT:
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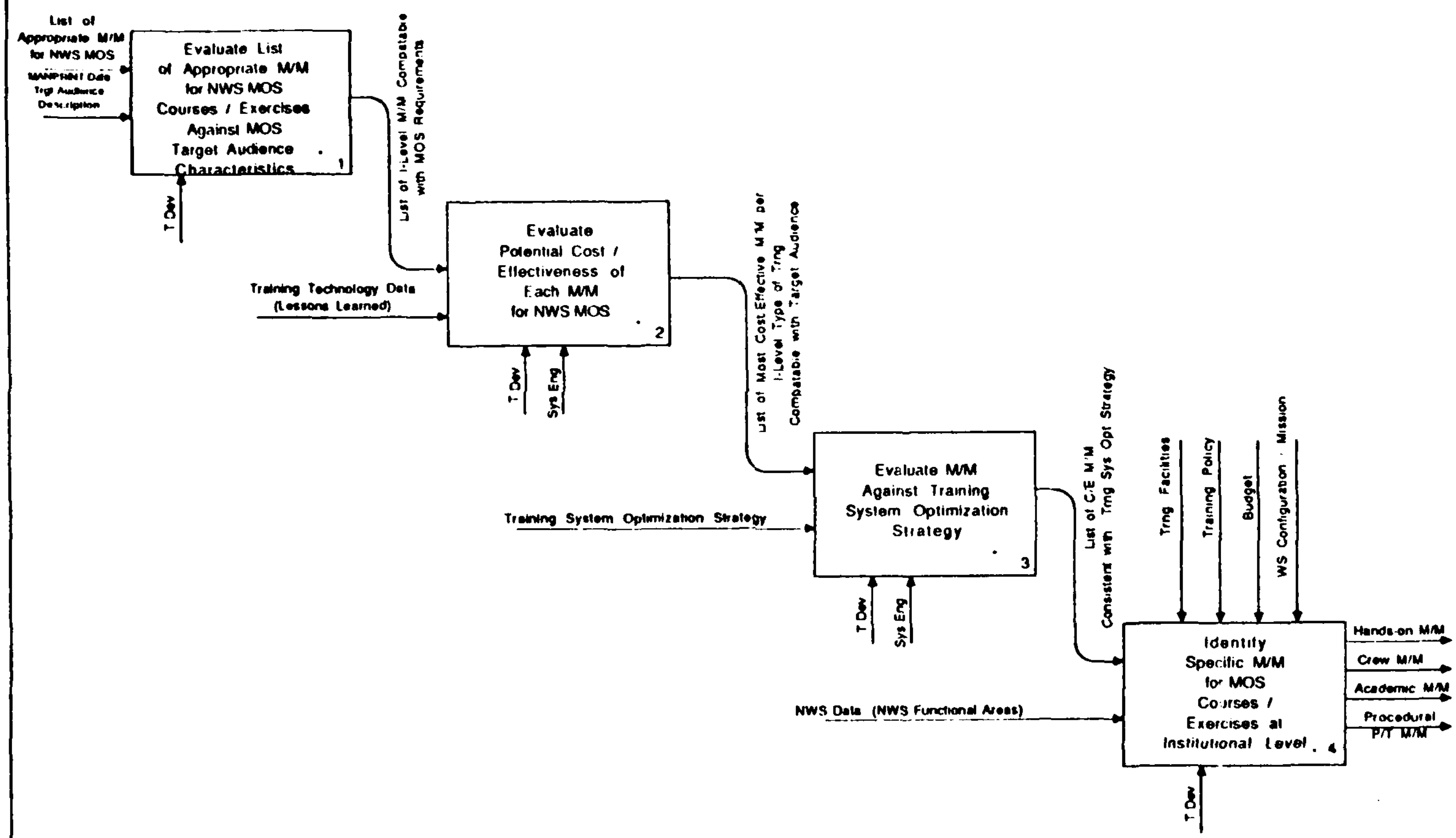
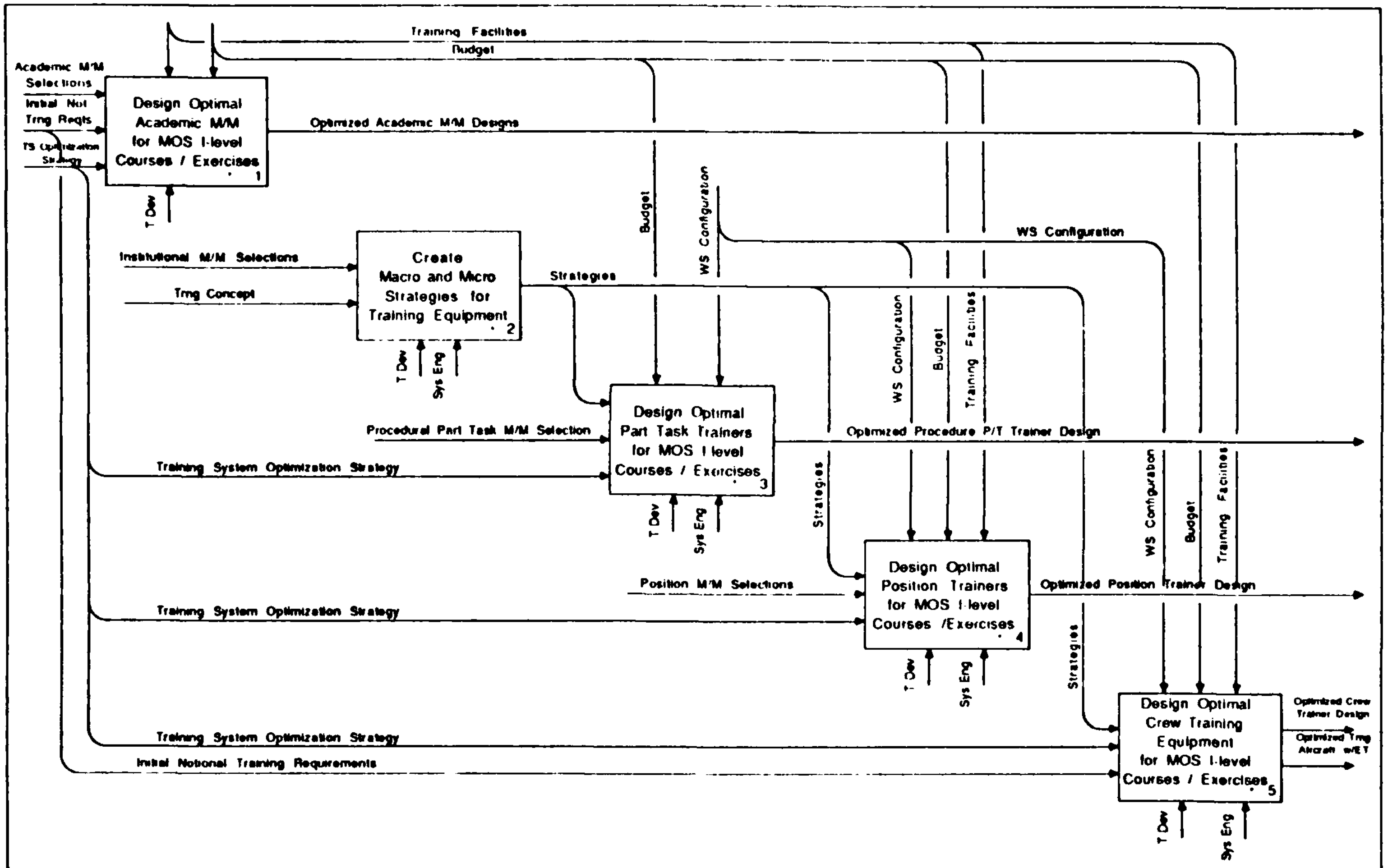


NODE:	TITLE:	NUMBER:
TRASER A0132322	Select Appropriate Methods / Media for Each Institution MOS Course / Exercise	

TRASER A0132322 SELECT APPROPRIATE METHODS AND MEDIA FOR EACH INSTITUTION MOS COURSE AND EXERCISE

Appropriate methods and media are evaluated against several factors to identify specific methods and media that will be designed for use in the MOS training system. Evaluation are made with target audience characteristics (to ensure that the media are compatible with MOS strengths and weaknesses), potential cost effectiveness (to ensure that the lowest cost media among equal options is selected), and against the Optimization Strategy (to ensure that selected media can be optimized in the directions required by the design approach philosophy. After these evaluations, a final selection is made which results in four categories of media pertinent to institutional level training.

USED AT: San Diego	AUTHOR: Feuge DATE: 1/16/90 PROJECT: TRASER REV: 1 NOTES: 1 2 3 4 5 6 7 8 9 10	WORKING DRAFT RECOMMENDED PUBLICATION	READER DATE	CONTEXT: A013232



NODE: TRASER A0132323

TITLE: Design Optimal Institutional Methods / Media for Each MOS Courses / Exercise

NUMBER:

TRASER A0132323 DESIGN OPTIMAL INSTITUTIONAL METHODS AND MEDIA FOR MOS COURSES AND EXERCISES

The training developer or system engineer at PM TRADE begins the actual design process. At this stage in the LCSMM process, design is at a functional level. The intent is to determine the form of each method or medium, the number required of each type, and the functional characteristics of each type that enable it to meet initial notional training requirements and the Optimization Strategy. Using classic definitions of academic media, part-task trainers, position trainers, and crew or mission trainers as well as historic design data, the user constructs the macro- and micro strategies which controls the sequence and function of the various types of media in the MOS pipeline. By applying the optimization prompts from the Training System Optimization Strategy, the user can shift the historical or classic functional design of media towards a more optimal design. The result is a series of designs for media that will used to generate input to LCSMM requirements.

USED AT:	AUTHOR: Feuge	DATE: 1/16/90		WORKING	READER	DATE	CONTEXT:
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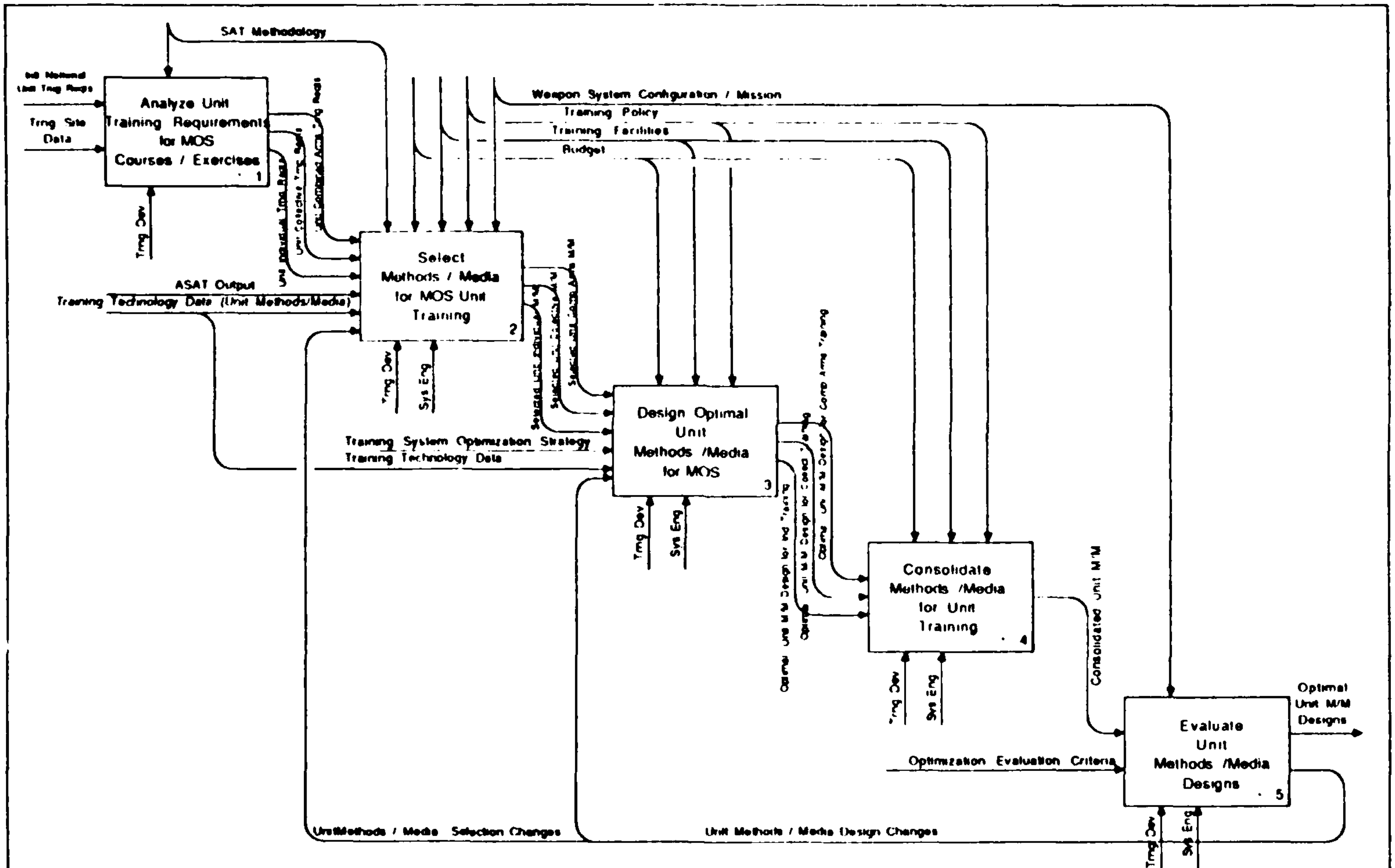
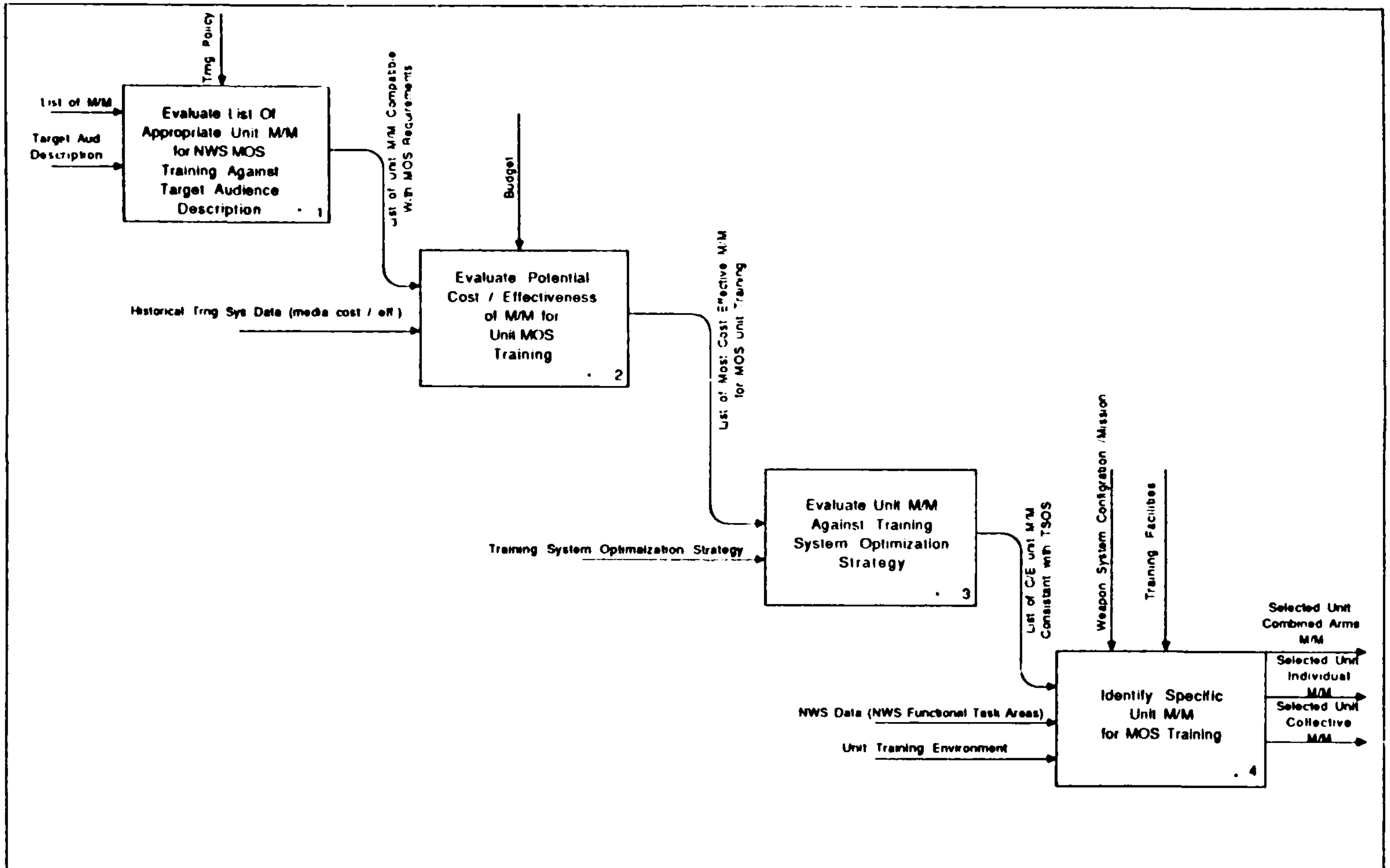


NODE:	TITLE:	NUMBER:
TRASER A013233	Design Optimal Methods /Media for MOS Unit Training	

TRASER A013233 DESIGN OPTIMAL METHODS AND MEDIA FOR MOS UNIT TRAINING

The user repeats the A0132323 steps except now they are performed for unit training. Here media selected must be tailored for conditions and facilities at the various unit sites. Otherwise, the process is the same as for institutional level training.

USED AT: San Diego	AUTHOR: Feuge PROJECT: TRASER NOTES: 1 2 3 4 5 6 7 8 9 10	DATE: 1/16/90 REV: 1		WORKING DRAFT RECOMMENDED PUBLICATION	READER	DATE	CONTEXT: A013233



NODE: TRASER A0132332	TITLE: Select Methods / Media for MOS Unit Training	NUMBER:

The user must also evaluate the appropriate methods and media list against target audience characteristics, cost effectiveness potential, and the Optimization Strategy to ensure that the methods and media are appropriate to the unit sites and their environments.

USED AT:	AUTHOR: Feuge	DATE: 1/16/90		WORKING	READER	DATE	CONTEXT:
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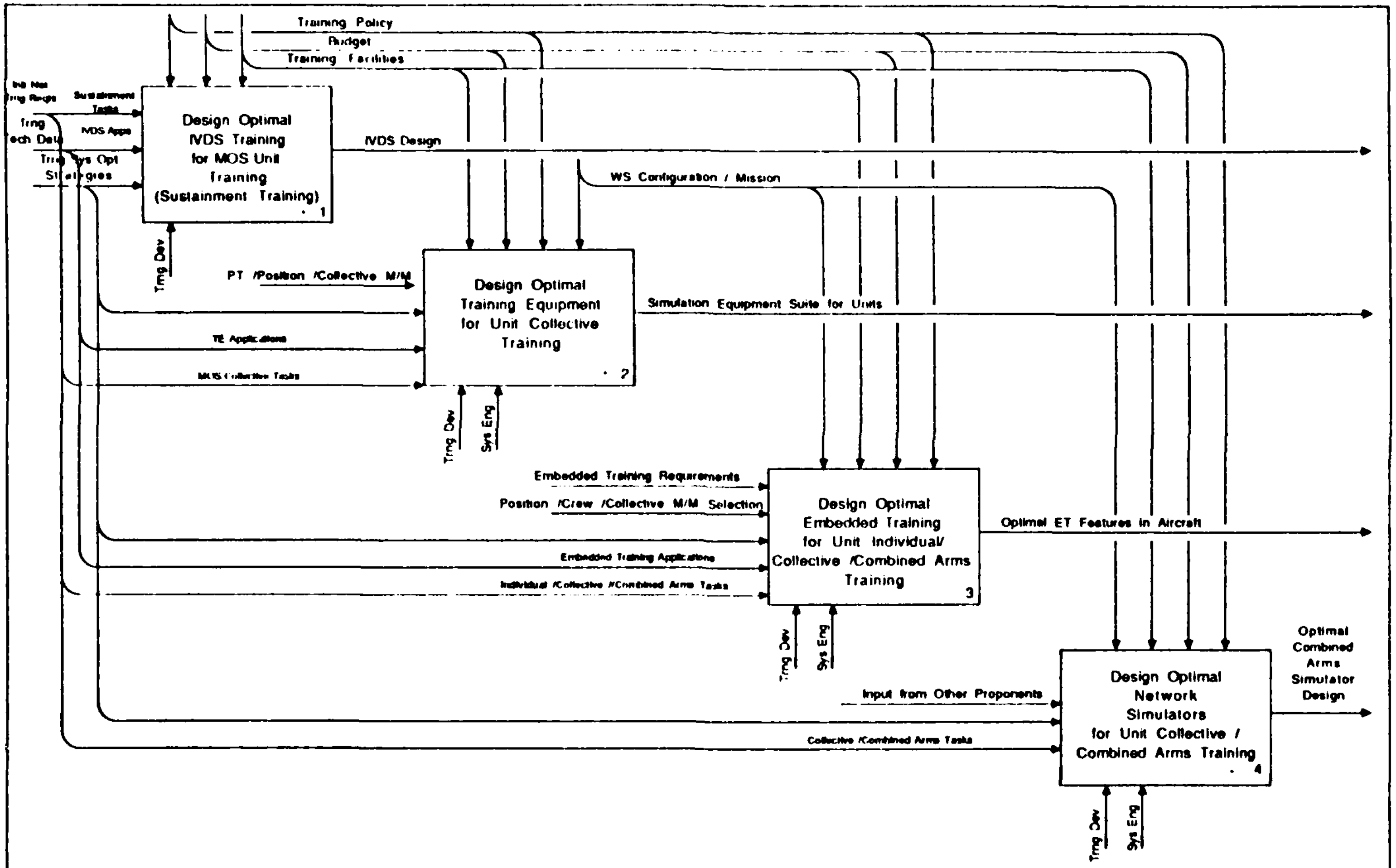

NODE:	TITLE:	NUMBER:
TRASER A0132333	Design Optimal Unit Methods / Media for MOS	

TRASER A0132333 DESIGN OPTIMAL UNIT METHODS AND MEDIA FOR MOS

Macro- and micro- strategies must be developed for unit level media prior to actual design work. Unit media to be designed include such things as interactive videodisk (IVDS), training equipment such as simulators, embedded training and portions of "network" simulators. As with institutional level design, the intent is to specify the form, number and functional characteristics of major media, applying the Optimization Strategy.

USED AT:	AUTHOR: Evans DATE 1/12/90		WORKING	READER	DATE	CONTEXT:
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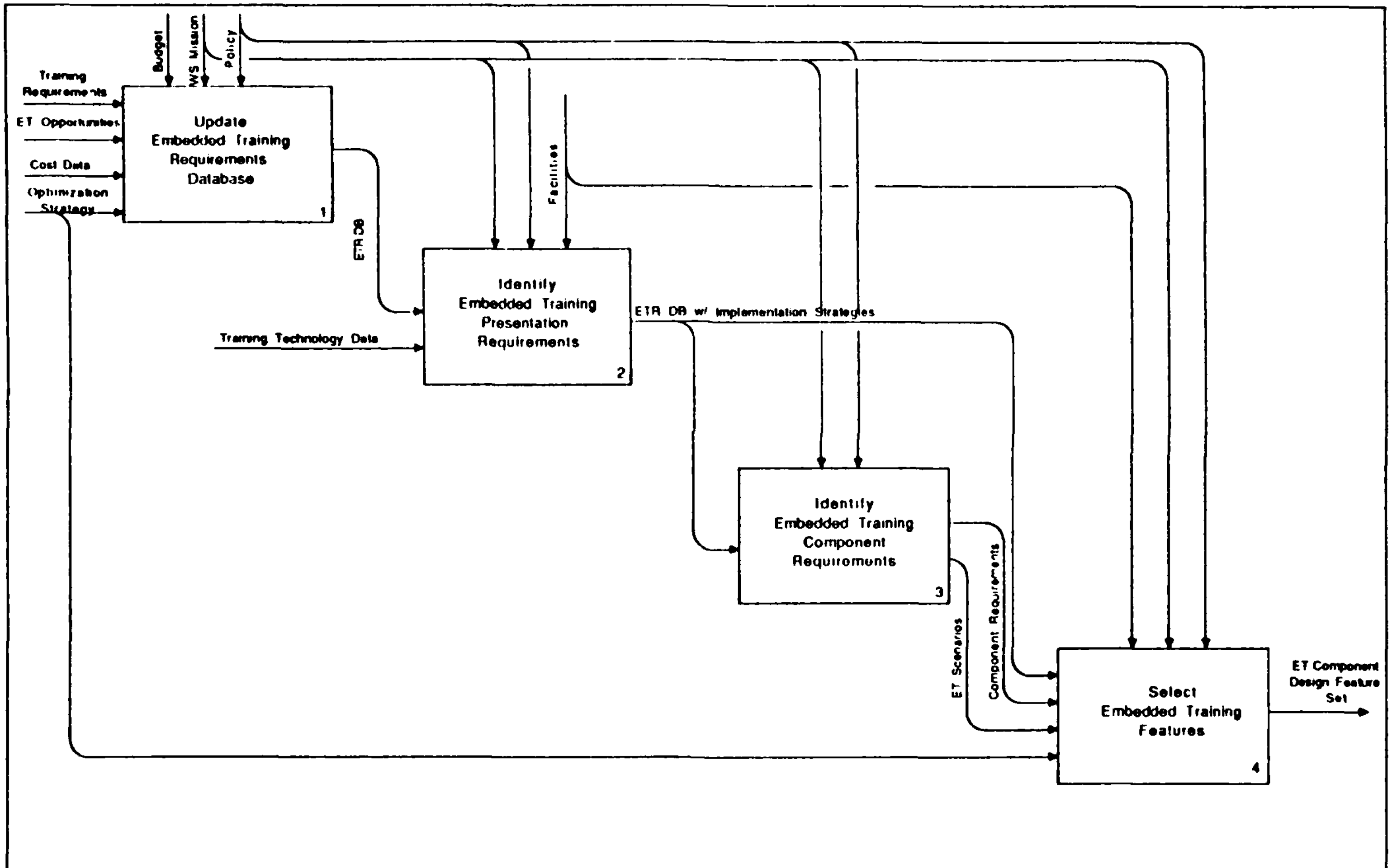

NODE:	TITLE:	NUMBER:
TRASER A01323333	Design Optimal Embedded Training for MOS Unit Training	

TRASER A01323333 DESIGN OPTIMAL EMBEDDED TRAINING FOR MOS UNIT TRAINING

This activity produces the optimal ET features for the new weapon system based on the currently available data on ET selection opportunities, requirements, crew selection, training technical data, and training optimization strategies. The Approach followed in identifying these features is derived from volumes 4 and 5 of the series Implementing Embedded Training (see Roth, 1988b, and Roth et al., 1988). It is important to note that the completeness of the feature set depends greatly on the accuracy and currency of the input data, especially that which determined the ET requirements. Because of this, the first step in the activity involves updating that ETR database with the most current weapon system characteristics, and situational or policy information. Here, as throughout the training system development effort, the training developer must maintain contact with the system developer to become aware of any new developments which would alter the perception of the soldier system interface, operational tasks, or hardware or software capability to support ET. This process would be greatly aided with the use of an automated database management system, and such a system would most likely be a part of TRASER. The outcome of the process is the set of features to support embedded training, based on the current weapon system description. The final ET design will be conducted later. This process should result in a clear understanding of what is feasible to implement in ET with the current configuration, as well as what would be difficult or expensive to implement. Should external policy or operational demands dictate the use of ET in areas deemed infeasible or costly as a result of this analysis, discussions with the system developer should inform all parties of the potential problems and work toward enhanced solutions.

USED AT:	AUTHOR: Evans	DATE 1/12/90		WORKING	READER	DATE	CONTEXT:
Arlington	PROJECT: TRASER	REV: 1		DRAFT			A01323333
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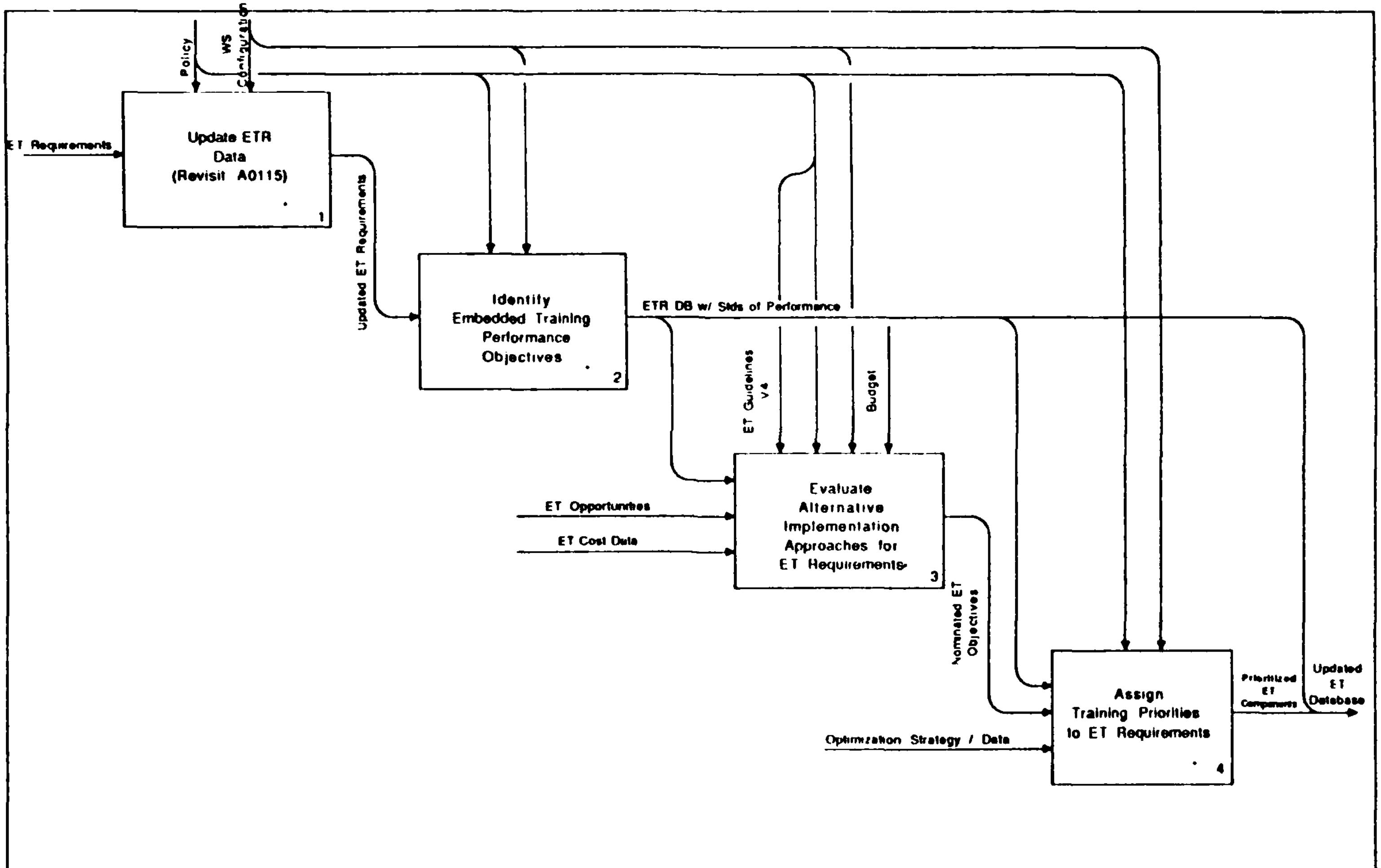

NODE: TRASER A013233331

TITLE: Update Embedded Training Requirements Database

NUMBER:

TRASER A013233331 UPDATE EMBEDDED TRAINING REQUIREMENTS DATABASE

This activity updates the ET requirements database produced in process A0115 and nominates and prioritizes training objectives from the database as candidates for ET. Procedures for assembling requirements are derived in part from those outlined in Volumes 3, 4, and 5 of the ET guidelines and procedures. (see Roth, 1988a, 1988b, and Roth et al., 1988). Any steps which were not completed previously due to lack of information should be revisited. Results of ongoing discussions with weapon system developers should be incorporated. Task standards of performance should be added to the database as well. Historical tasks and training policy can assist here. ET opportunities, identified in A011112 and cost factors are compared against the requirements with an algorithm such as that proposed in ET volume 4 to evaluate implementation approaches for the ET requirements. This follows a top-down approach, and looks at generic classes of requirements to assess feasibility prior to conducting a progressively more detailed analysis. The detailed analysis is conducted for the performance objectives of each MOS or duty position. The algorithm compares the the characteristics of the requirement against the opportunities provided by the prime system, its hardware and software, and its operating environment, and design, development, operating and maintenance operational costs. The final outcome of the process is a set of prioritized ET requirements, where priority as based on the kinds of training objectives, the ease of implementation, and the task criticality.

USED AT:	AUTHOR: Evans	DATE 1/12/90		WORKING	READER	DATE	CONTEXT:
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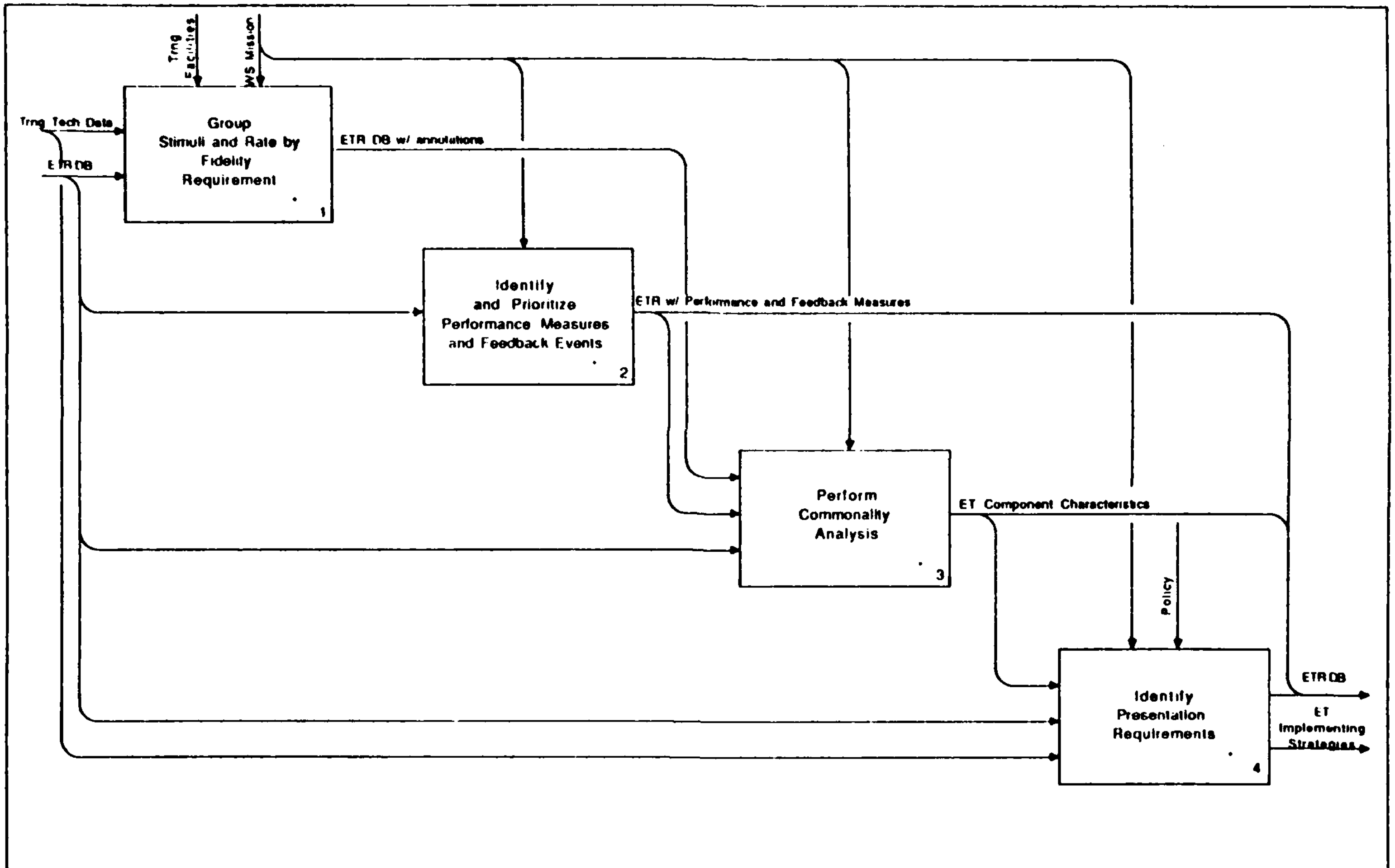
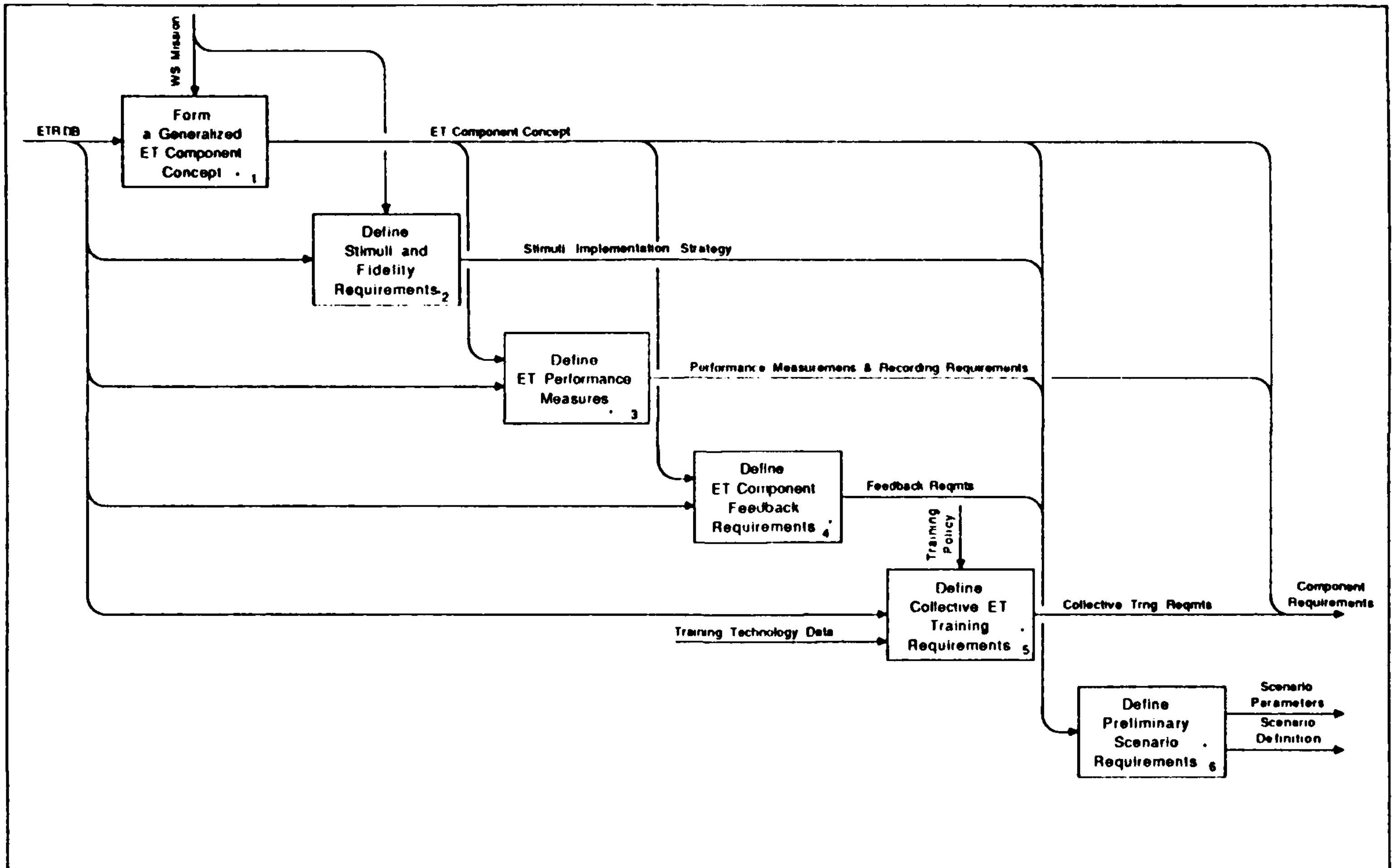


NODE:	TITLE:	NUMBER:
TRASER A013233332	Identify Embedded Training Presentation Requirements	

TRASER A013233332 IDENTIFY ET PRESENTATION REQUIREMENTS

This activity further analyzes each ET requirement to determine the stimuli associated with task performance and the relevant performance measures, feedback, and recording demands. The outcome is a detailed, though possibly preliminary, description of how each training objective is to be presented to the trainee. The process follows that presented in Volume 5 of the ET guidelines (see Roth et al., 1988). If specific data are not available to complete each step, specific assumptions may be made about ET characteristics, with the assumptions noted as such, and revisited later as more accurate information is available. Unlike the previous top-down process (in A013233331, this activity takes a bottom-up approach, reviewing the stimuli, performance, feedback and recording demands of each training objective. To avoid duplicate or unnecessary effort at the early stages of training concept design, this approach should be applied to the highest possible level of ET objectives defined subject to ET opportunities in the previous activity. The commonality analysis reviews training presentation requirements and categorizes these by common sensory mode, measures of performance, or recording events. Sensory modes include visual, auditory, tactile, or kinesthetic; performance categories include time to complete, speed of response, or correct action selection; recording event categories include summary feedback, trainee assessment, crew or team assessment, instruction management, or unit assessment. All annotations are noted in the TRASER ET requirements database. The results of these detailed evaluations will be reviewed and aggregated in subsequent stages.

USED AT: Arlington	AUTHOR: Evans PROJECT: TRASER NOTES: 1 2 3 4 5 6 7 8 9 10	DATE 1/12/90 REV: 1		WORKING DRAFT RECOMMENDED PUBLICATION	READER	DATE	CONTEXT: A01323333



NODE: TRASER A013233333	TITLE: Identify Embedded Training Component Requirements	NUMBER:

TRASER A013233333 IDENTIFY ET COMPONENT REQUIREMENTS

This activity uses the data developed in the previous two activities to develop some specific ET component requirements, and from those preliminary requirements, defines an initial ET component concept. Detailed information from the previous activity is compiled to produce an aggregate ET component definition. When performing the ET design early in the acquisition process, data may not be sufficiently detailed or complete to perform all the steps in this phase, particularly activities 2, 3 and 4. These can be omitted initially, but should be noted as such, and definitely revisited at a later time when more complete data are available. The last activity in the process determines preliminary scenario and parameter requirements for input to NWS designers. It is important that results from this activity be documented in a form which will facilitate later tradeoff studies.

USED AT:	AUTHOR: Evans	DATE: 1/12/90		WORKING	READER	DATE	CONTEXT:
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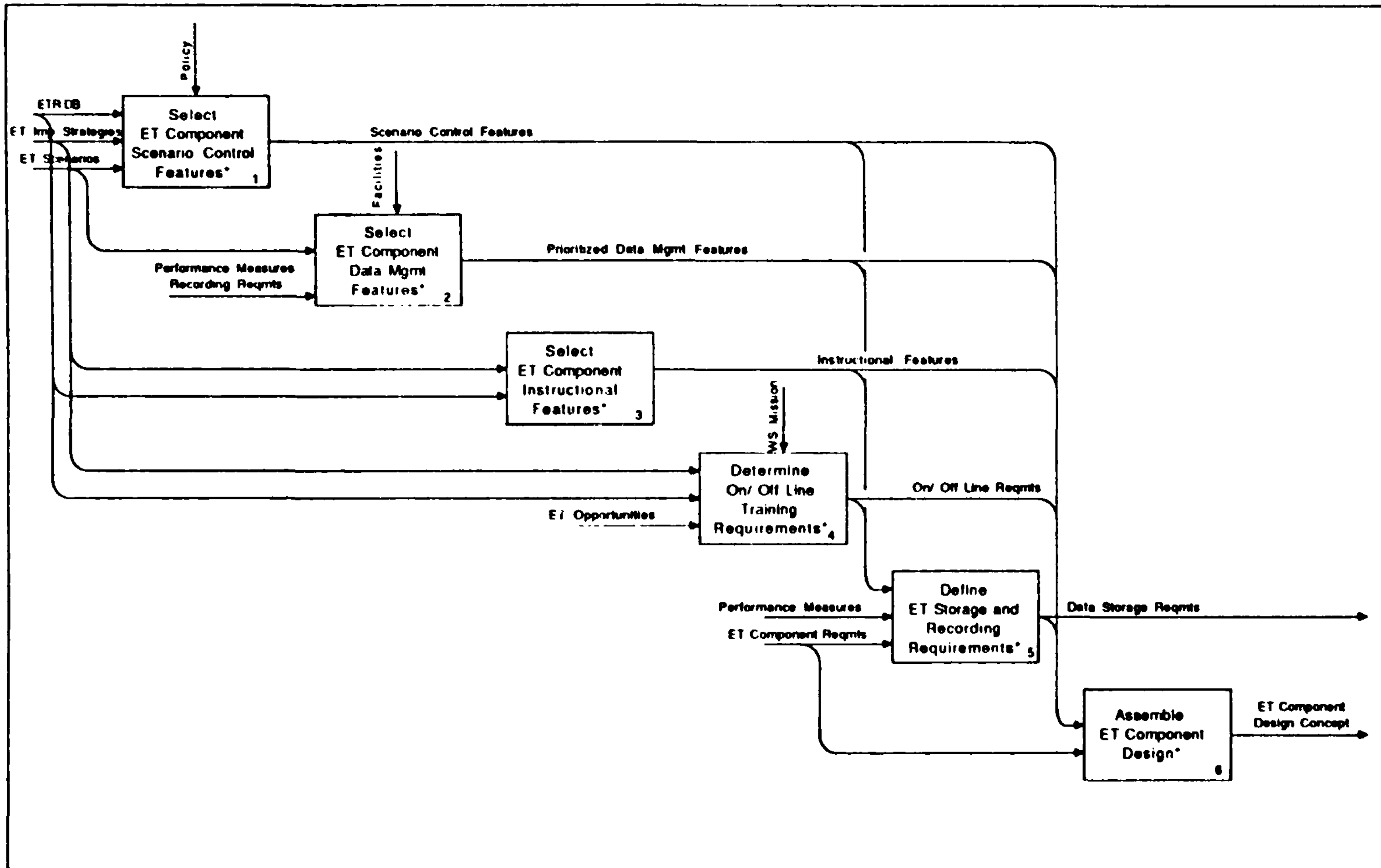

NODE:	TITLE:	NUMBER:
TRASER A013233334	Select Embedded Training Features	

TRASER A013233334 SELECT EMBEDDED TRAINING FEATURES

This activity defines the steps for selecting the various features an embedded training component may have. Input to the process come from previously defined activities. The features selected have a definite impact on the hardware and software design and should be explicitly defined. A final process within the step assembles all the selected features into an integrated ET component design concept. Completion of this activity is dependent on the amount of information available at the time. It may be necessary to omit this process in very early stages of NWS design. This omission should be noted. In any case, the activity should be revisited often once additional or revised data are available during the acquisition process.

USED AT:	AUTHOR: Feuge	DATE: 1/16/90		WORKING	READER	DATE	CONTEXT:
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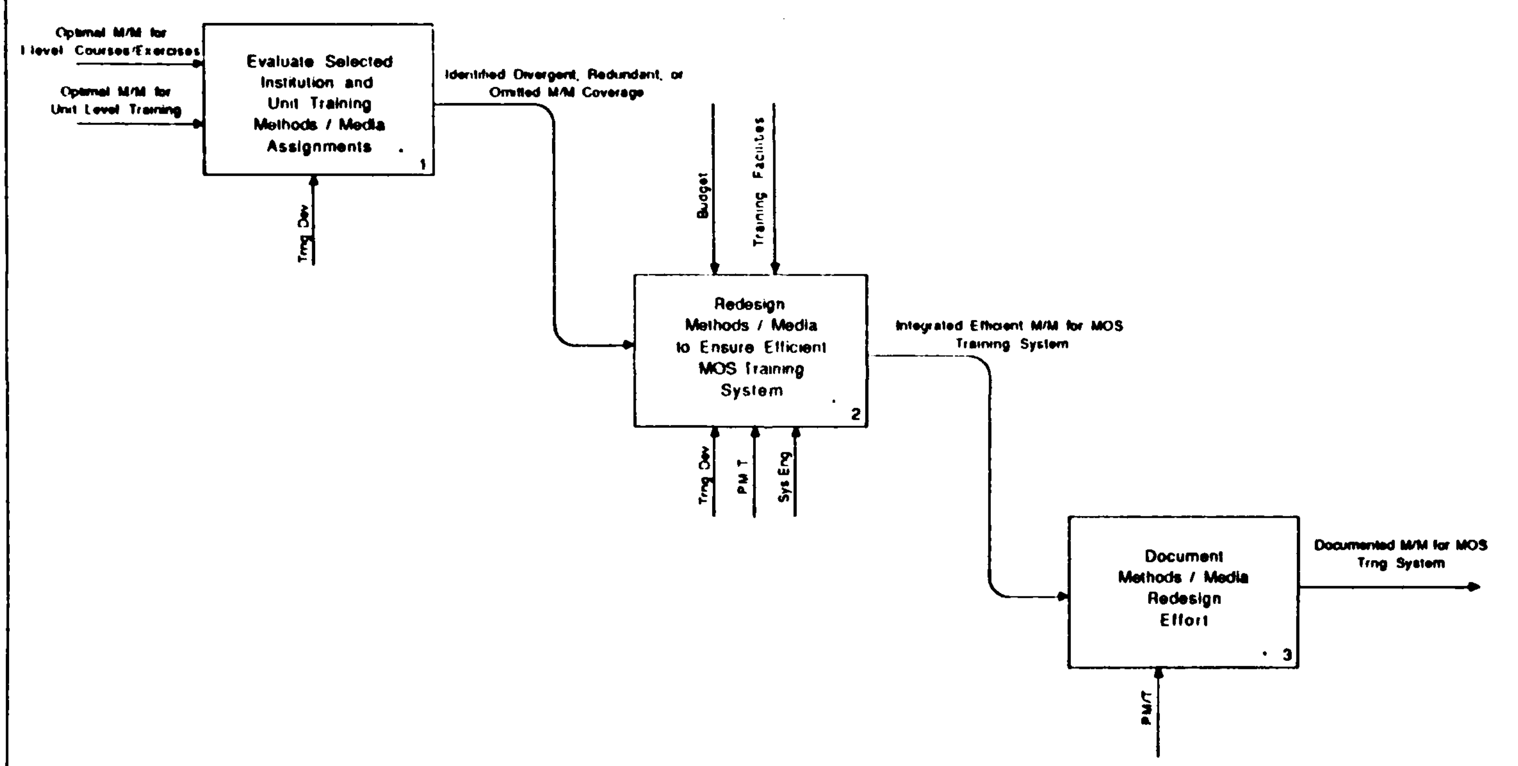

NODE:	TITLE:	NUMBER:
TRASER A013234	Integrate Methods / Media Within MOS Training System	

TRASER A013234 INTEGRATE METHODS AND MEDIA WITHIN MOS TRAINING SYSTEM

In this portion of the architecture, the institution and unit methods and media are integrated to ensure that training is efficiently conducted along the entire training pipeline. This process may require redesign of methods or media, if major deficiencies or redundancies are discovered in the integration.

USED AT:	AUTHOR: Feuge	DATE: 1/16/90	WORKING	READER	DATE	CONTEXT:
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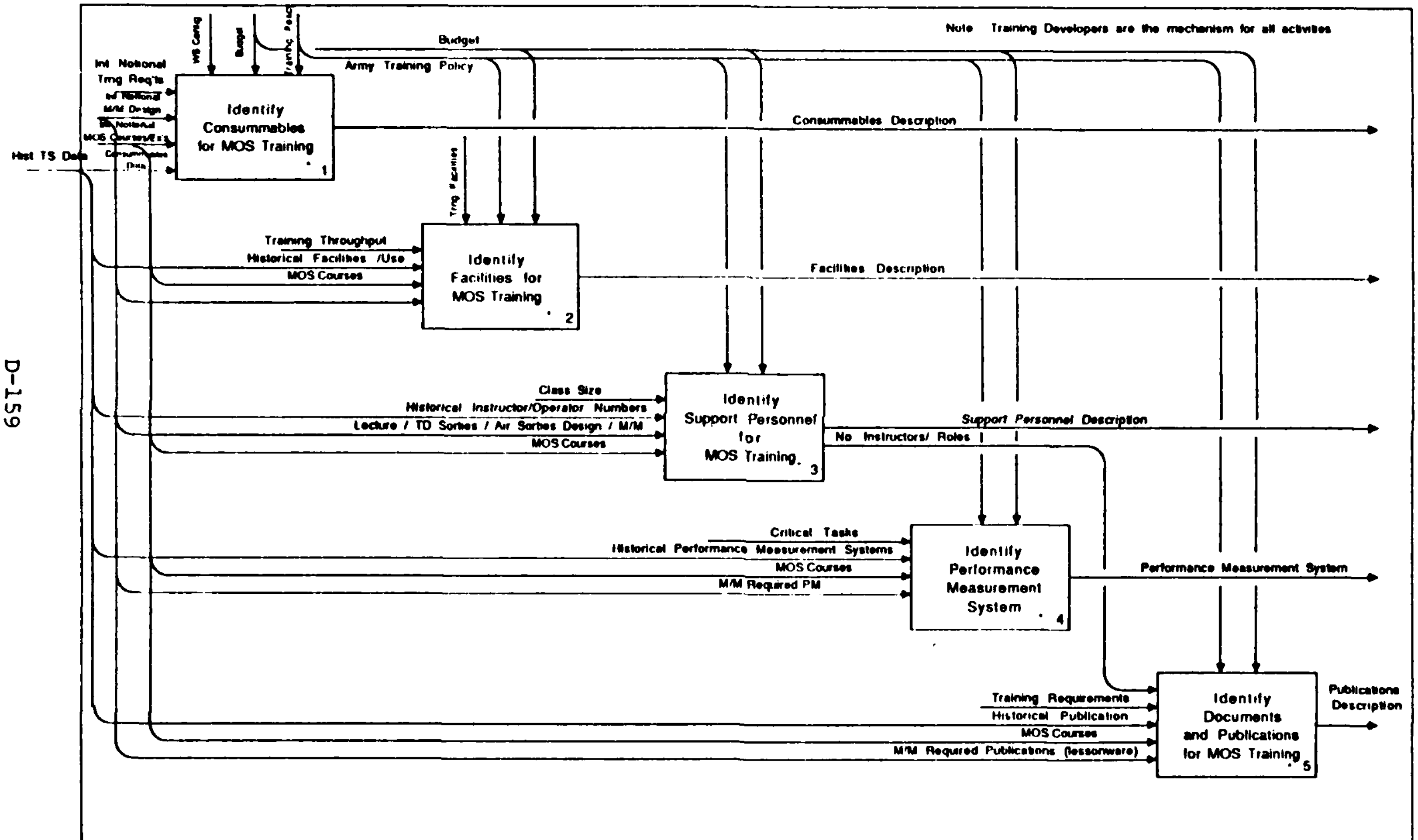

NODE:	TITLE:	NUMBER:
TRASER A01324	Identify Other Components of the MOS Training System	

TRASER A01324 IDENTIFY OTHER COMPONENTS OF THE MOS TRAINING SYSTEM

Other components of the MOS training system must be identified. These components of the training system include consummables (such as training ammunition), facilities (such as buildings and other MILCON), support personnel (such as instructors, device operators, and others), performance measurement systems, and technical documents (such as operator manuals and instructor guides). Due to being in the early stage of the LCSMM process, these components will be identified as notional and based heavily on historical data. Exceptions to a historical basis are where new training technology enables something better, such as microcomputers enabling better objective performance measurement systems. Together with the methods and media, these components round out the MOS training system.

USED AT:	AUTHOR: Feuge	DATE: 1/16/90	WORKING	READER	DATE	CONTEXT:
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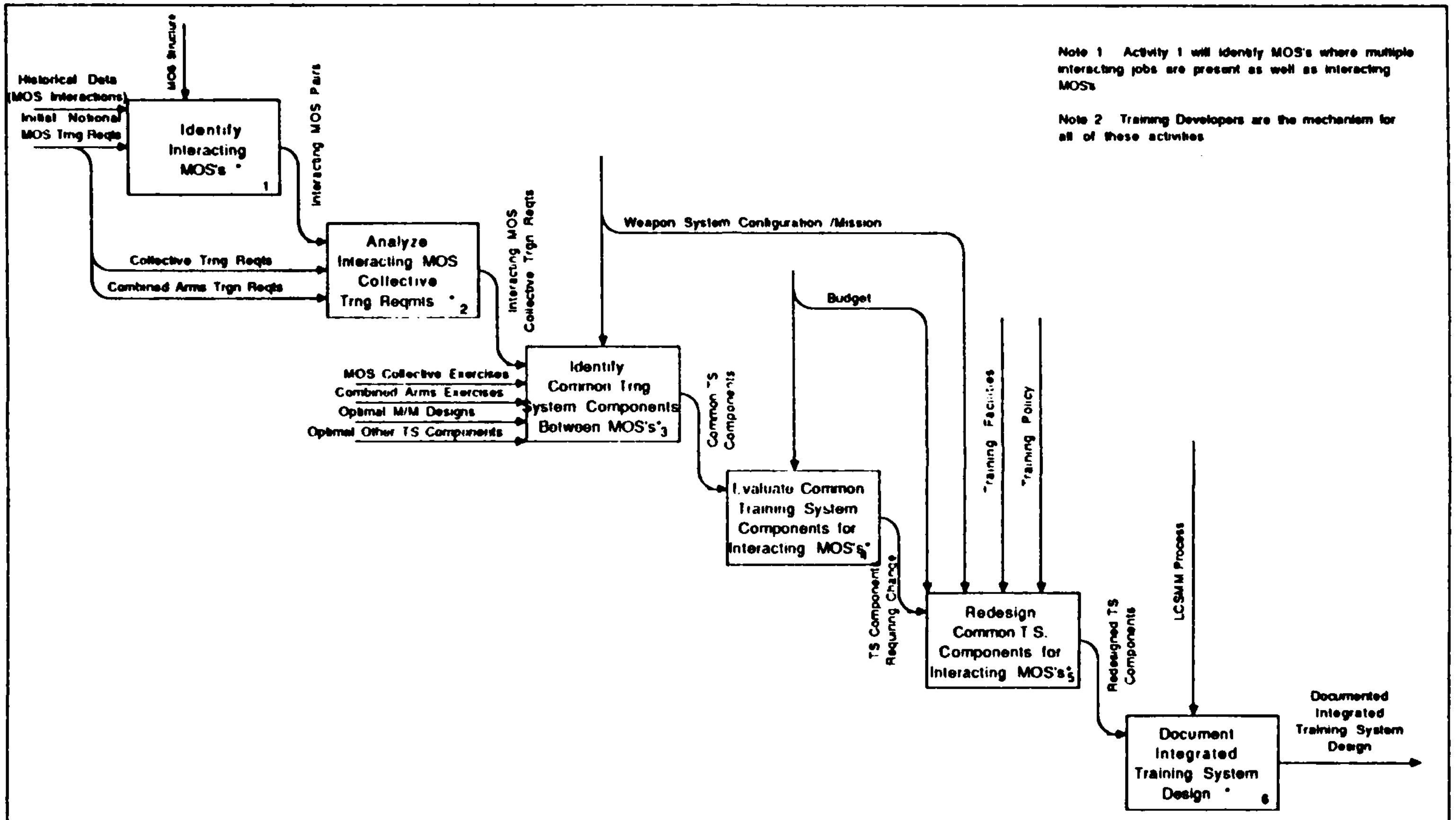

Note 1 Activity 1 will identify MOS's where multiple interacting jobs are present as well as interacting MOS's

Note 2 Training Developers are the mechanism for all of these activities

NODE:	TITLE:	NUMBER:
TRASER A01325	Integrate MOS Training Systems	

TRASER A01325 INTEGRATE MOS TRAINING SYSTEMS

Collective training within the MOS structure is addressed by first identifying interacting MOSs (e.g., pilots and gunners) and then identifying specific methods and media where the MOS's could interact together to permit crew or other collective training. If necessary, the designs for specific methods and media will revised to accommodate collective training. The last step of this process is to document necessary design changes, if any.

USED AT:	AUTHOR: Feuge	DATE: 1/16/90		WORKING	READER	DATE	CONTEXT:
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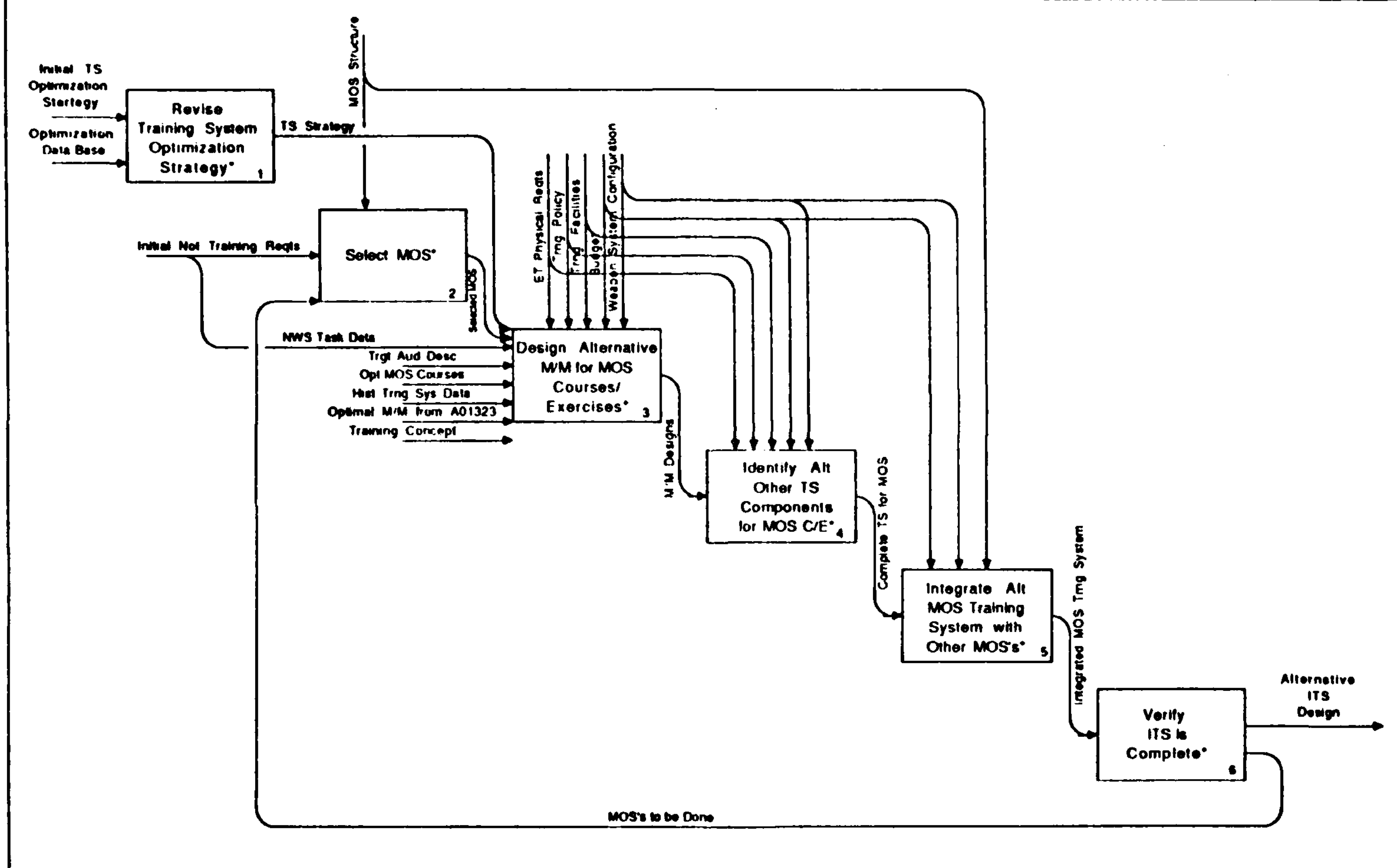
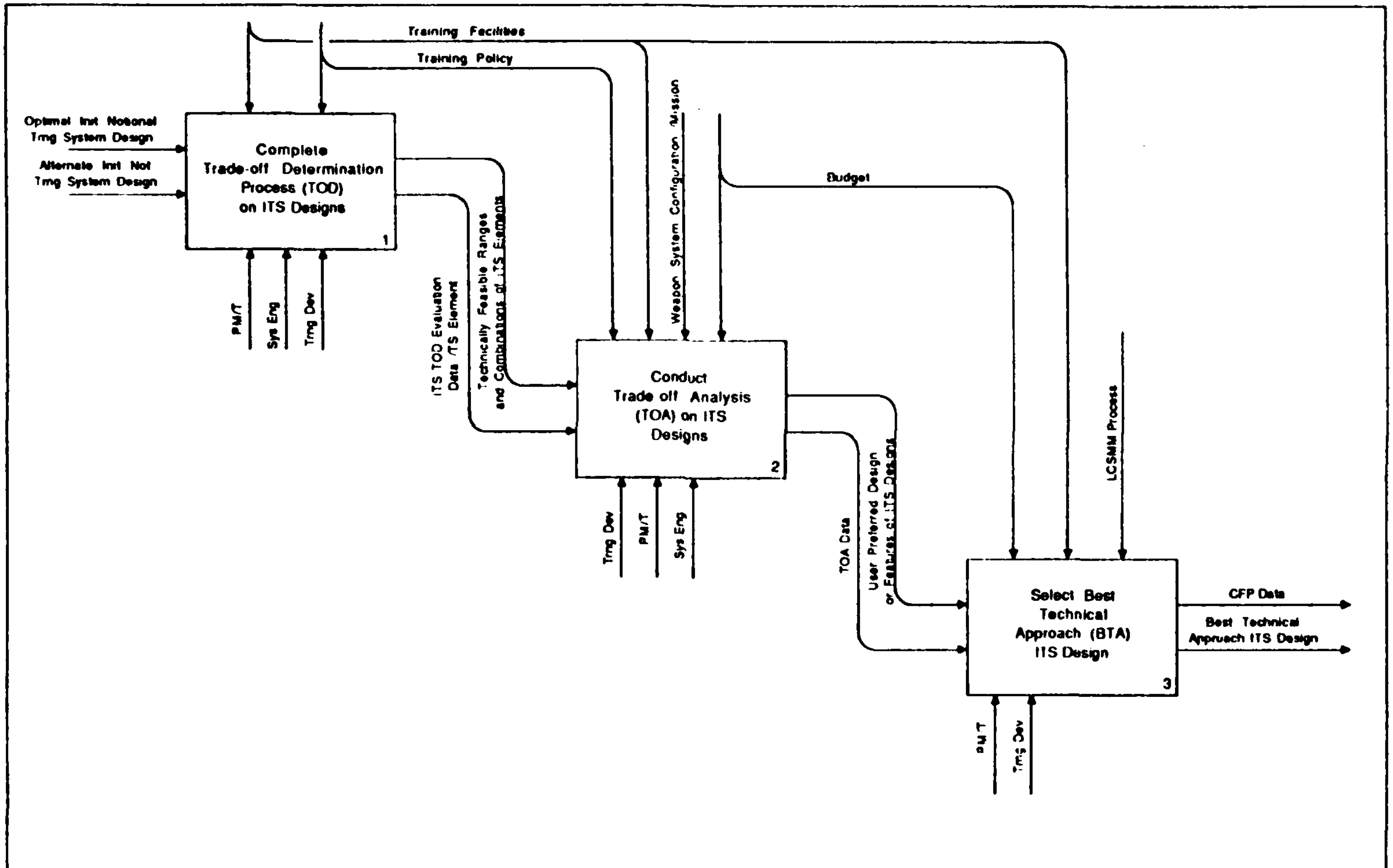


NODE:	TITLE:	NUMBER:
TRASER A0133 •	Design Alternative Notional Integrated Training Systems for MOS's	

TRASER A0133 DESIGN ALTERNATIVE NOTIONAL INTEGRATED TRAINING SYSTEMS FOR MOSs

Alternative designs for the ITS are created as part of the Trade-off Determination (TOD) process, which is part of the Concept Formulation Process. This activity, mandated by AR 70-19, requires AMC to create other feasible designs which can be presented to the gaining command for its evaluation in Trade-off Analysis (TOA). The process includes revising the Training System Optimization Strategy and redesigning the various components of the training system for each MOS. Revisions to the Optimization Strategy will amount to altering the design approach philosophy which will yield different design optimization prompts. Such changes will affect the method and media selection process as well. Otherwise, the process is the same as before with the optimal design.

USED AT: San Diego	AUTHOR : Feuge PROJECT: TRASER NOTES: 1 2 3 4 5 6 7 8 9 10	DATE: 1/16/90 REV: 1	WORKING DRAFT RECOMMENDED PUBLICATION	READER DATE	CONTEXT: A013

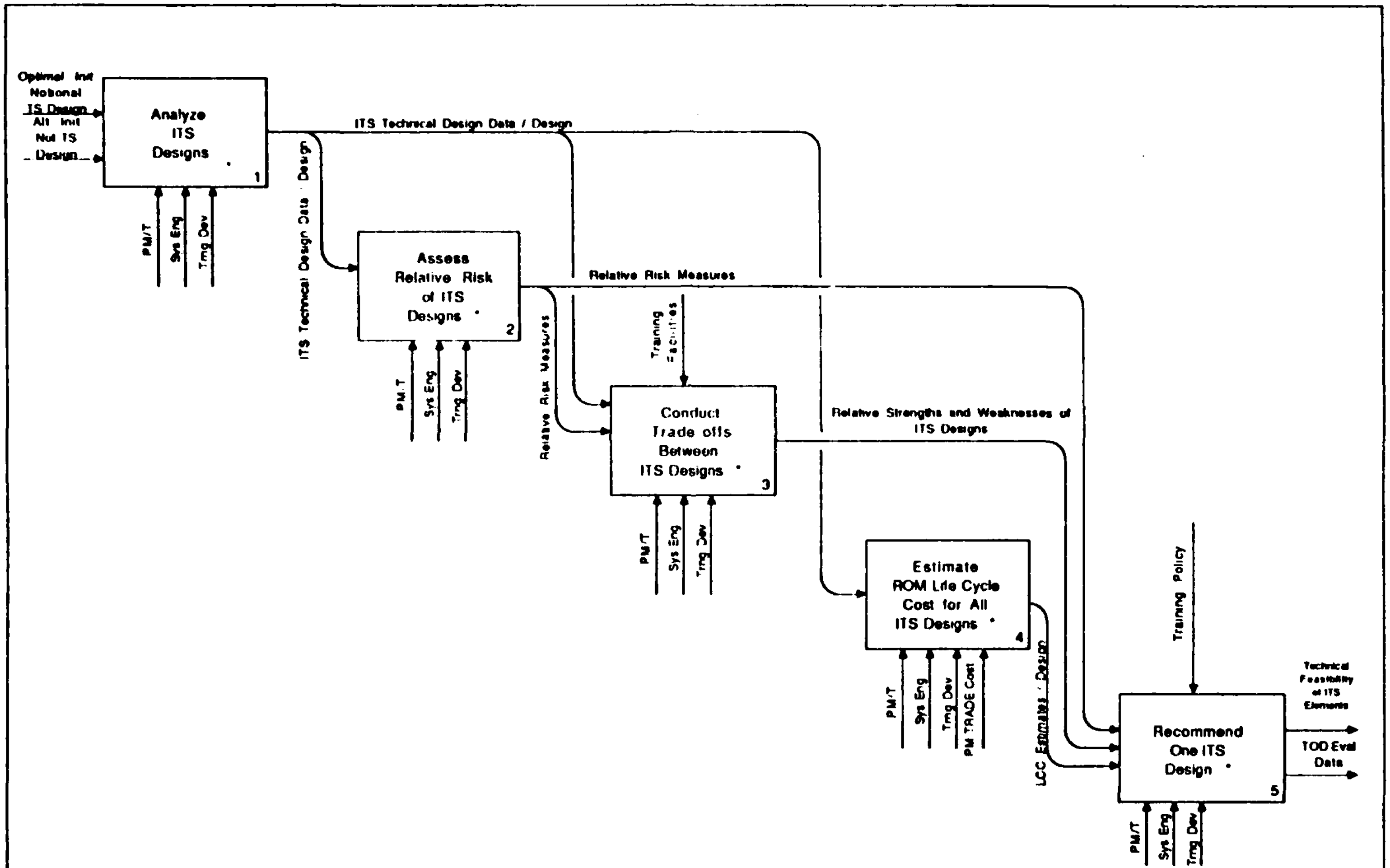


NODE: TRASER A0134	TITLE: Complete Concept Formulation Process (CFP)	NUMBER:

TRASER A0134 CONDUCT CONCEPT FORMULATION PROCESS (CFP)

The CFP process is nearly completed for the optimal and alternative ITS designs. As part of this process, the TOD process is completed by creating supporting data, the TOA is completed by the gaining command (TRADOC), and the Best Technical Approach (BTA) is selected and justified.

USED AT: San Diego	AUTHOR: Feuge DATE: 1/16/90 PROJECT: TRASER REV: 1 NOTES: 1 2 3 4 5 6 7 8 9 10		WORKING DRAFT RECOMMENDED PUBLICATION	READER DATE	CONTEXT: A0134



NODE: TRASER A01341

TITLE: Complete Trade-off Determination (TOD) Process on ITS Design

NUMBER:

TRASER A01341 COMPLETE TRADE-OFF DETERMINATION (TOD) PROCESS ON ITS DESIGNS

In this activity, PM/T, system engineers from PM TRADE, and training developer personnel will analyze all ITS designs, assess their relative risks, conduct trade-off analyses between the competing designs, and estimate the rough order of magnitude cost for each design.

USED AT:	AUTHOR: Feuge	DATE: 1/16/90		WORKING	READER	DATE	CONTEXT:
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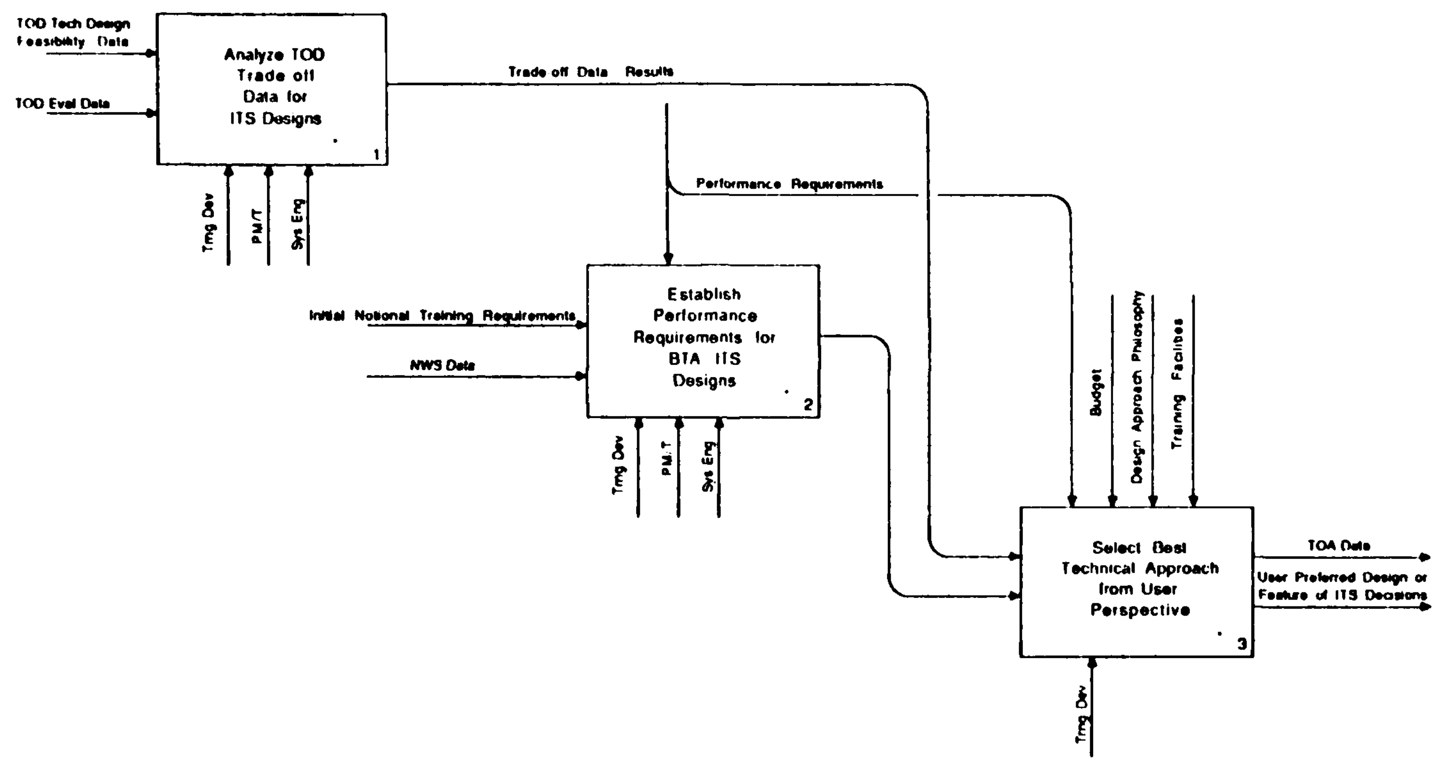

NODE:	TITLE:	NUMBER:
TRASER A01342	Conduct Trade-off Analysis (TOA) on ITS Designs	

TRASER A01342 CONDUCT TRADE-OFF ANALYSIS (TOA) ON ITS DESIGNS

This activity, performed primarily by PM/T, analyzes TOD data from a user perspective. This analysis takes into account training site environmental factors as well as information about the NWS and its training requirements in conducting the TOA. In the final step, the user selects the BTA design or design features from its perspective. These results are output to the actual BTA process which is AMC's responsibility.

USED AT:	AUTHOR: Feuge	DATE: 1/16/90		WORKING	READER	DATE	CONTEXT:
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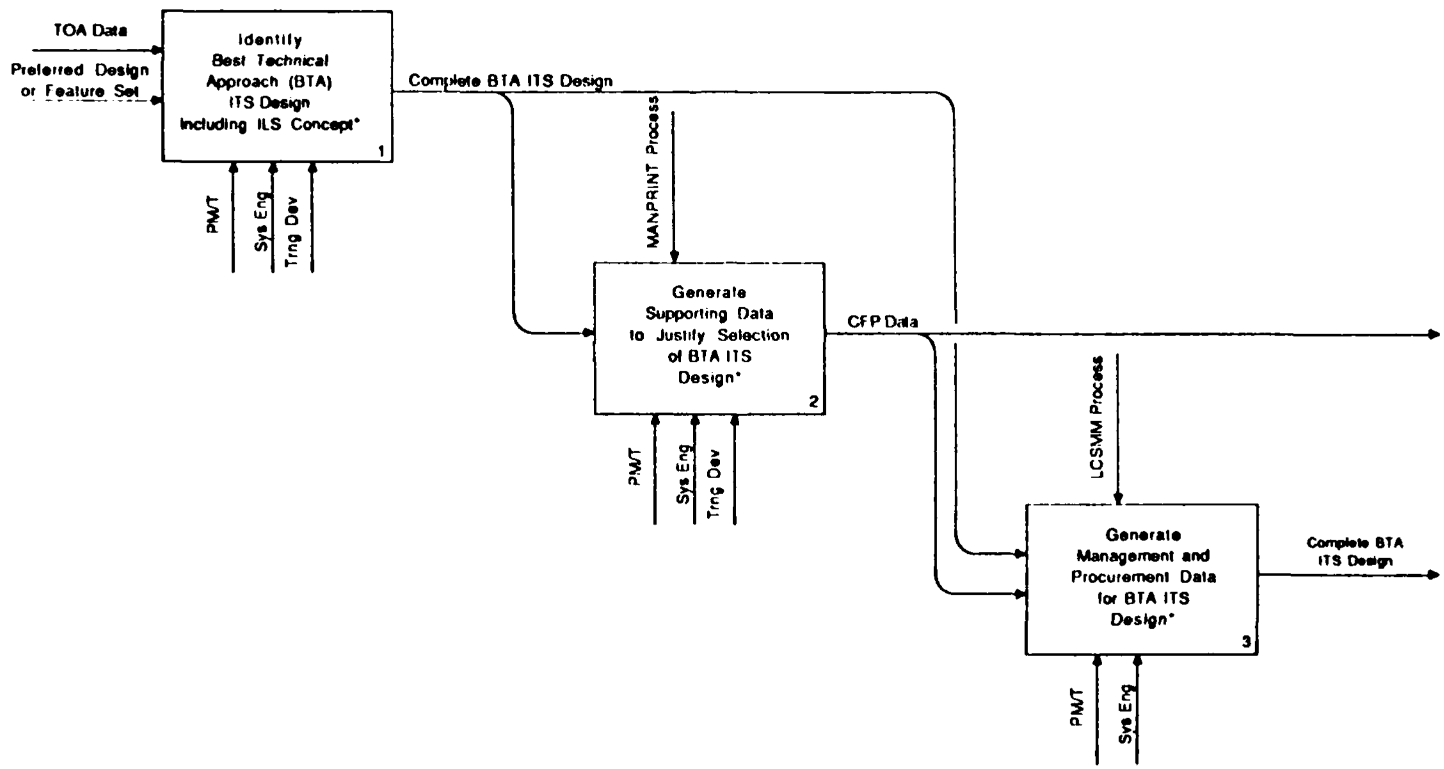

NODE:	TITLE:	NUMBER:
TRASER A01343	Select Best Technical Approach (BTA) ITS Design	

TRASER A01343 SELECT BEST TECHNICAL APPROACH (BTA) ITS DESIGN

In this activity, AMC, with assistance from the user, identifies the BTA design and generates supporting data for it selection. In addition, management data regarding procurement, schedule, and other related matters must be generated and documented.

USED AT:	AUTHOR: Feuge	DATE: 1/15/90	WORKING	READER	DATE	CONTEXT:
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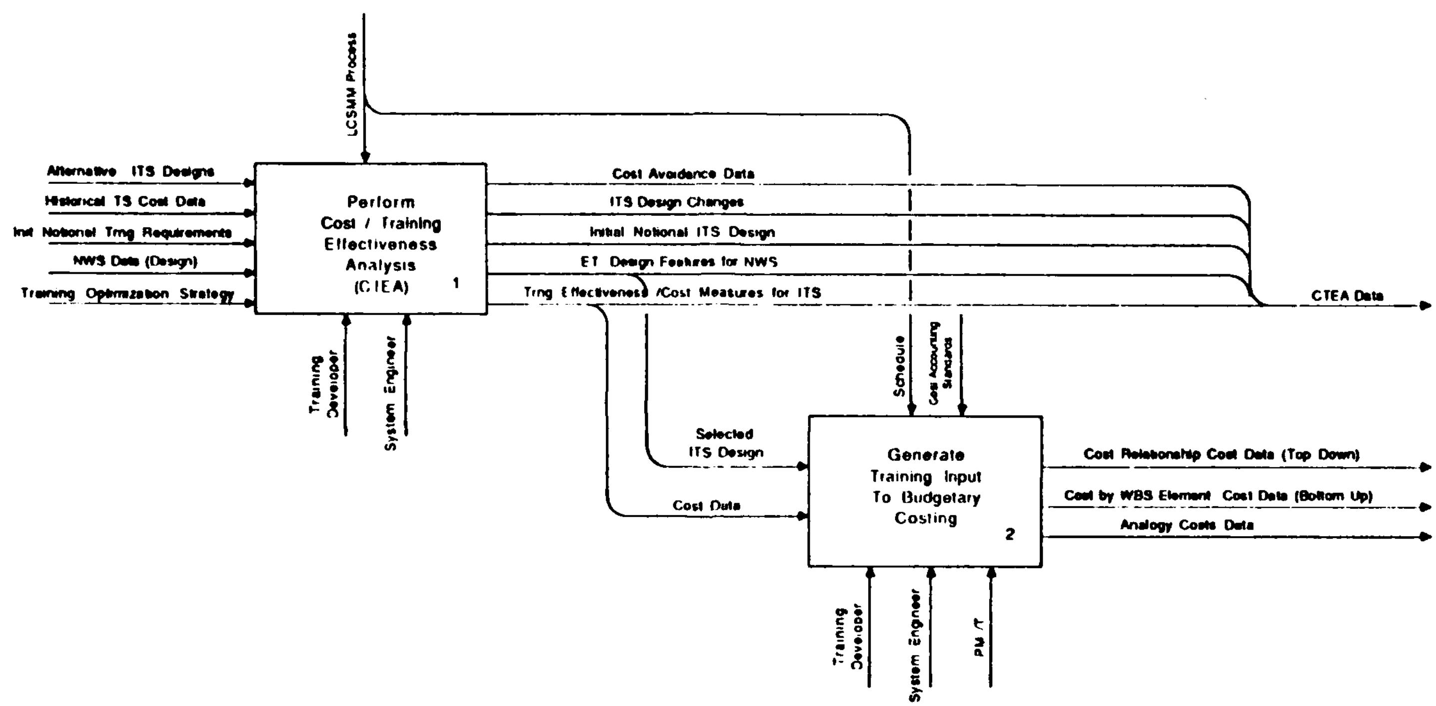

NODE:	TITLE:	NUMBER:
TRASER A014	Evaluate Initial Notional Training System Designs	

TRASER A014 EVALUATE INITIAL NOTIONAL TRAINING SYSTEM DESIGNS

All alternative training system designs are subjected to a Cost and Training Effectiveness Analysis (CTEA) which is part of the larger Cost and Operational Effectiveness Analysis (COEA) performed on the parent weapon system. The CTEA is the last step of the Concept Formulation process. The result is a selected training system design which will be carried forward as the "training concept" through Concept Exploration into Demonstration and Validation. The second step of the process is to provide cost data to AMC cost analysts who prepare budgets and entries to the POM cycle for the weapon system, including the training system component of the weapon system.

USED AT:	AUTHOR: Feuge	DATE: 1/15/90	WORKING	READER	DATE	CONTEXT:
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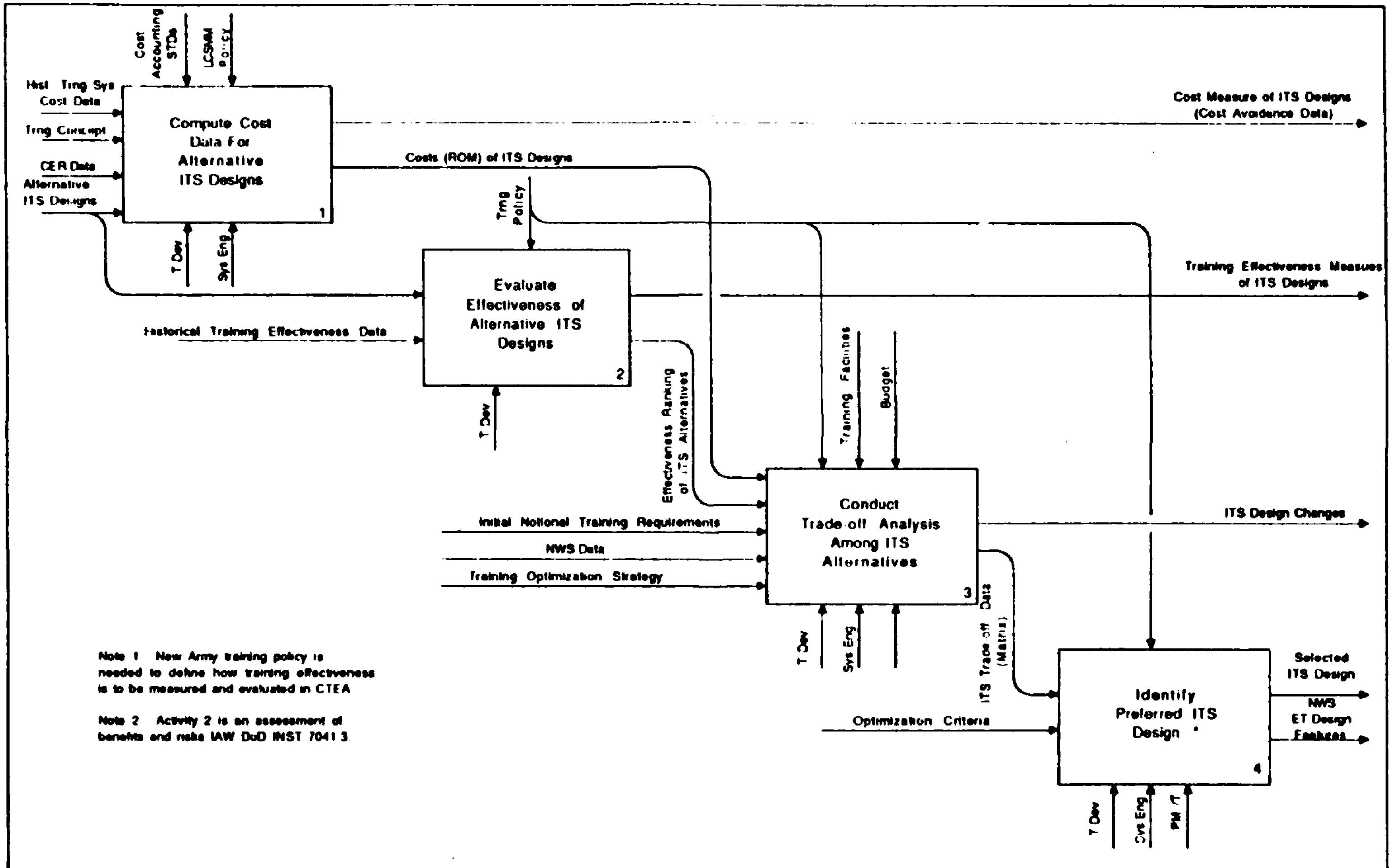


Note 1 New Army training policy is needed to define how training effectiveness is to be measured and evaluated in CTEA

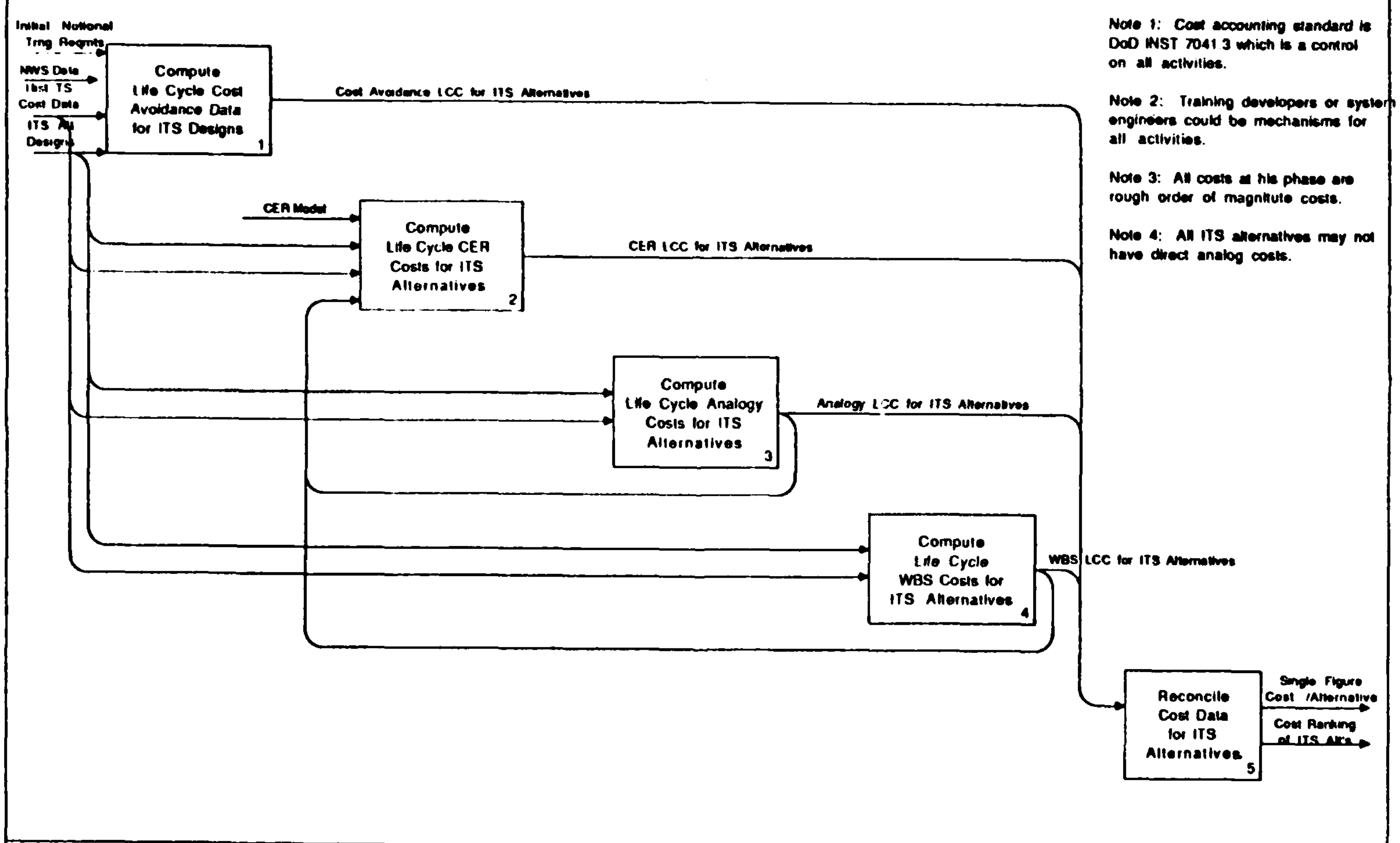
Note 2 Activity 2 is an assessment of benefits and risks IAW DoD INST 7041.3

NODE:	TITLE:	NUMBER:
TRASER A0141	Perform Cost / Training Effectiveness Analysis (CTEA)	

TRASER A0141 PERFORM COST AND TRAINING EFFECTIVENESS ANALYSIS (CTEA)

The relative cost and effectiveness of each alternative training system design will be established and traded-off to select the preferred ITS design for future use. To provide flexibility in TRASER, several costing options and several ways of assessing effectiveness are provided. This approach is consistent with present DoD cost benefit analysis policy but extends policy to alternate forms of analysis not widely used in the Army.

USED AT: San Diego	AUTHOR: Feuge DATE: 1/15/90 PROJECT: TRASER REV: 1 NOTES: 1 2 3 4 5 6 7 8 9 10		WORKING DRAFT RECOMMENDED PUBLICATION	READER DATE	CONTEXT: A0141



NODE: TRASER A01411	TITLE: Compute Cost Data for Alternative ITS Designs	NUMBER:

TRASER A01411 COMPUTE COST DATA FOR ALTERNATE ITS DESIGNS

Various methods of costing training systems are provided, including "cost avoidance", "cost estimation relationship" costing, "analogy" costing, and "Work Breakdown Structure" costing. These methods should be considered as alternative forms of analysis, one method used to check one another, rather than a list of mandatory cost analyses. The final step is used to reconcile divergent cost estimates from one or more of the methods, if divergences exist. These methods, with the exception of cost avoidance, are outlines by DoDINST 7041.3 for cost benefit analysis.

USED AT:	AUTHOR: Feuge	DATE: 1/15/90	WORKING	READER	DATE	CONTEXT:
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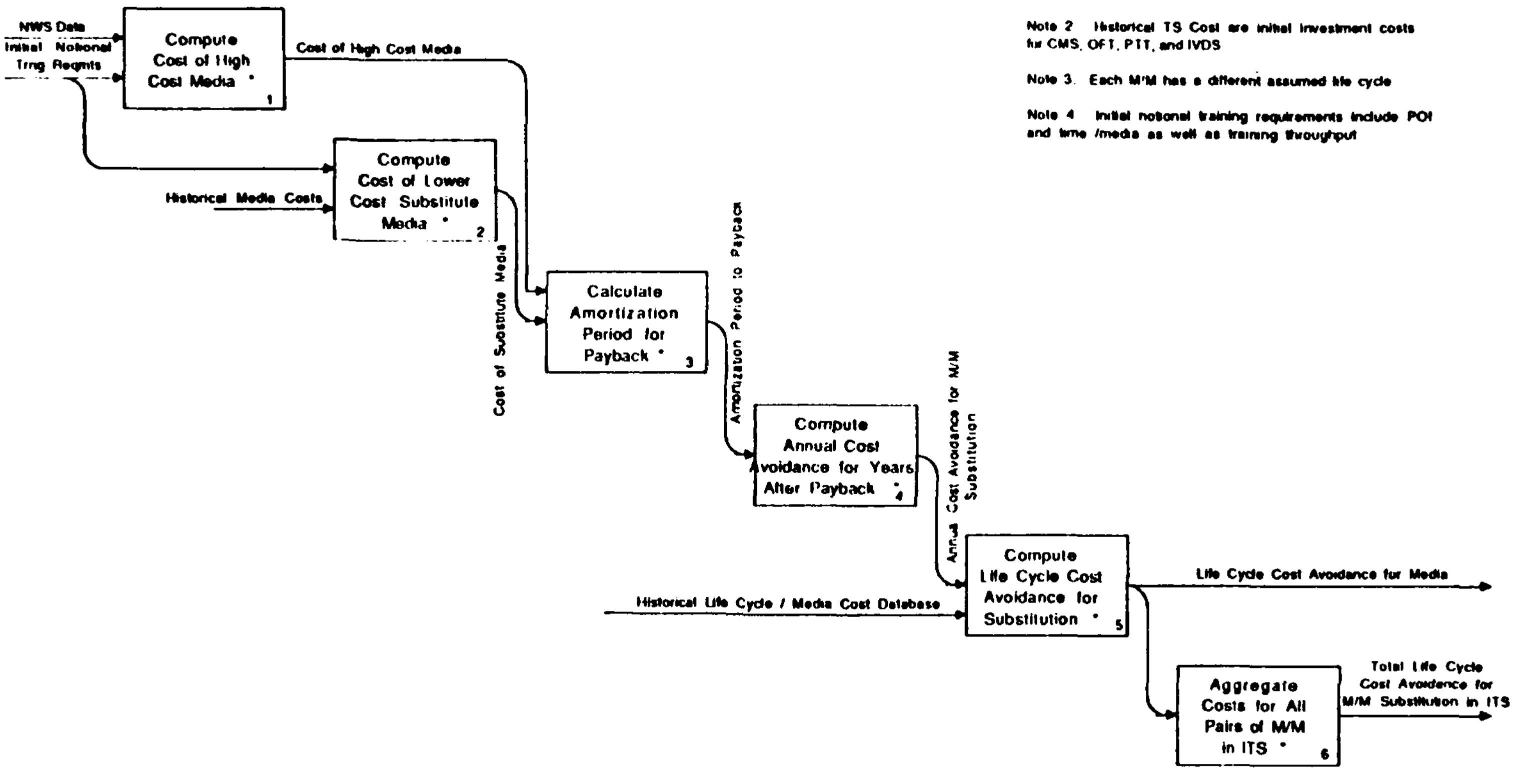

Note 1 NWS data for activity 1 includes cost /Trng aircraft, O&S cost /aircraft, and POI hours dedicated to ET /NWS

Note 2 Historical TS Cost are initial investment costs for CMS, OFT, PTT, and IVDS

Note 3. Each M/M has a different assumed life cycle

Note 4 Initial notional training requirements include POI and time /media as well as training throughput

NODE:	TITLE:	NUMBER:
TRASER A014111	Compute Life Cycle Cost Avoidance for ITS Alternatives	

TRASER A014111 COMPUTE LIFE CYCLE COST AVOIDANCE FOR ITS ALTERNATIVES

In this activity, the cost avoidance created by substituting lower cost media for higher cost media is determined for the life cycle of each ITS design. This technique was developed and successfully applied in the Army LHX CTEA process. The process is to compute the relative costs of the rival media and use these data to determine how many years it will take to pay back the additional cost of the additional lower cost media (e.g., CMS) needed to offset the reduction in higher cost media (e.g., training aircraft). The cost avoidance, defined in terms of costs not paid by the Army after the amortization (payback) date, is computed on an annual basis and then computed over a 15 year life cycle basis for various media alternatives within each alternative ITS design.

USED AT:	AUTHOR: Feuge	DATE: 1/15/90		WORKING	READER	DATE	CONTEXT:
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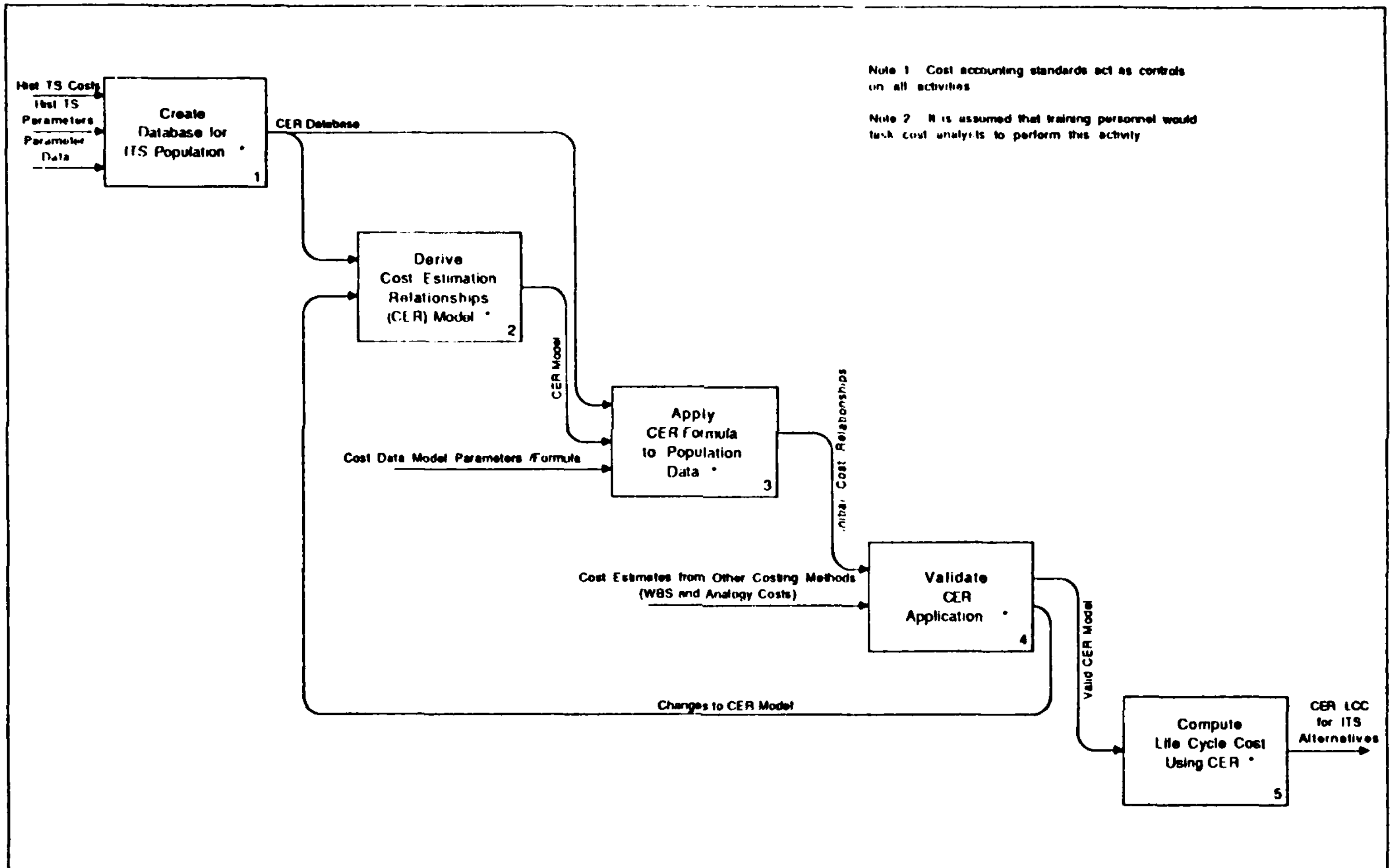
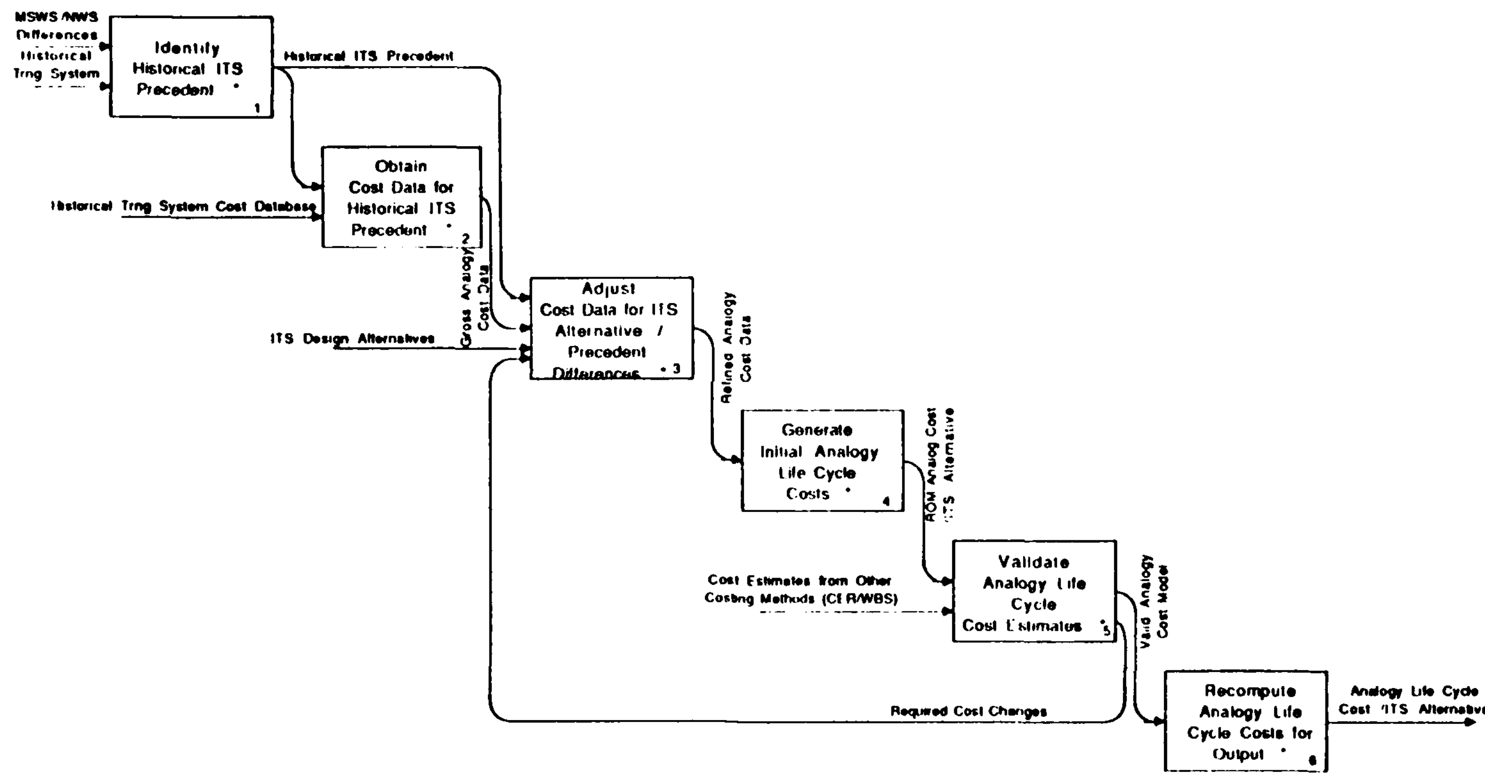


NODE:	TITLE:	NUMBER:
TRASER A014112	Compute Life Cycle CER Costs for ITS Alternatives	

TRASER A014112 COMPUTE LIFE CYCLE CER COSTS FOR ITS ALTERNATIVES

Cost estimating relationships (CER) are used to calculate life cycle costs for each ITS alternative. Use of CERs involves the use of mathematical models to predict aggregate cost for the ITS, based on knowledge of key cost relationships between components of the ITS. The COCOMO approach is one published example of a CER model that has been applied within DoD for software cost estimating. The CER approach involves development of a population database about the various ITS designs and their component costs, development of a CER math model to fit the database, validation of the model, and application. This approach is considered a "top-down" approach.

USED AT: San Diego	AUTHOR: Feuge PROJECT: TRASER NOTES: 1 2 3 4 5 6 7 8 9 10	DATE: 1/15/90 REV: 2		WORKING DRAFT RECOMMENDED PUBLICATION	READER	DATE	CONTEXT: A01411

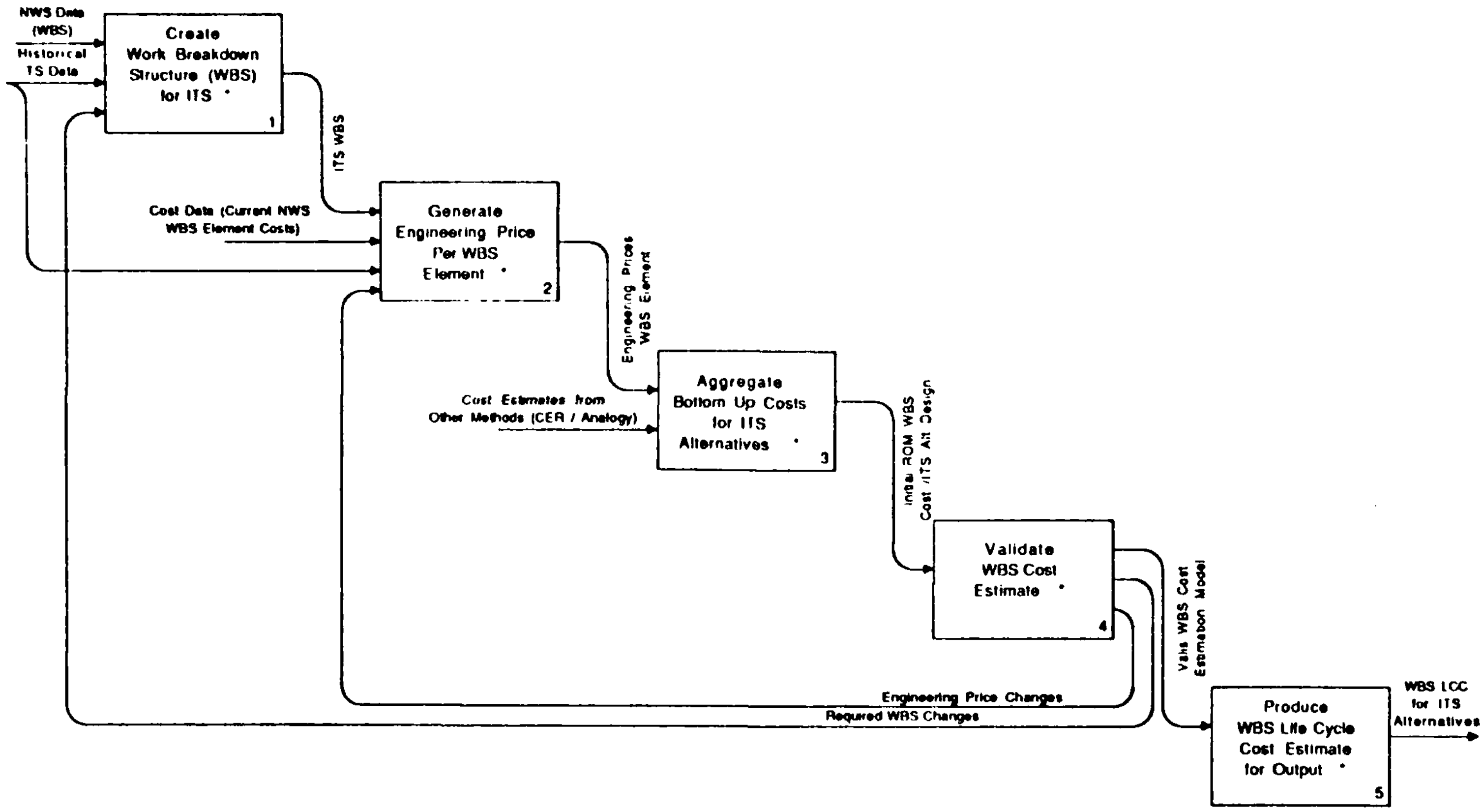


NODE: TRASER A014113	TITLE: Compute Life Cycle Analogy Costs for ITS Alternatives	NUMBER:

TRASER A014113 COMPUTE LIFE CYCLE ANALOGY COSTS FOR ITS ALTERNATIVES

The life cycle costs of the ITS alternatives are generated by using analogous costs from a historical, similar training system. The historical analogy can be based on an entire training system design or discrete components. Obviously, the accuracy and validity of this approach is based on the closeness of the analogy. This costing approach is probably the most frequently used in the Army.

USED AT: San Diego	AUTHOR: Feuge DATE: 1/15/90 PROJECT: TRASER REV: 1 NOTES: 1 2 3 4 5 6 7 8 9 10		WORKING DRAFT RECOMMENDED PUBLICATION	READER DATE	CONTEXT: A01411



NODE: TRASER A014114	TITLE: Compute Life Cycle WBS Costs for ITS Alternatives	NUMBER:

TRASER A014114 COMPUTE LIFE CYCLE WBS COSTS FOR ITS ALTERNATIVES

The life cycle cost is generated by creating a work breakdown structure of the ITS components and costing each of them separately. Life cycle cost is the aggregate cost of all components over the life of the ITS. This approach, also called the engineering cost approach, is a bottom-up cost approach.

USED AT:	AUTHOR: Feuge	DATE: 1/15/90		WORKING	READER	DATE	CONTEXT:
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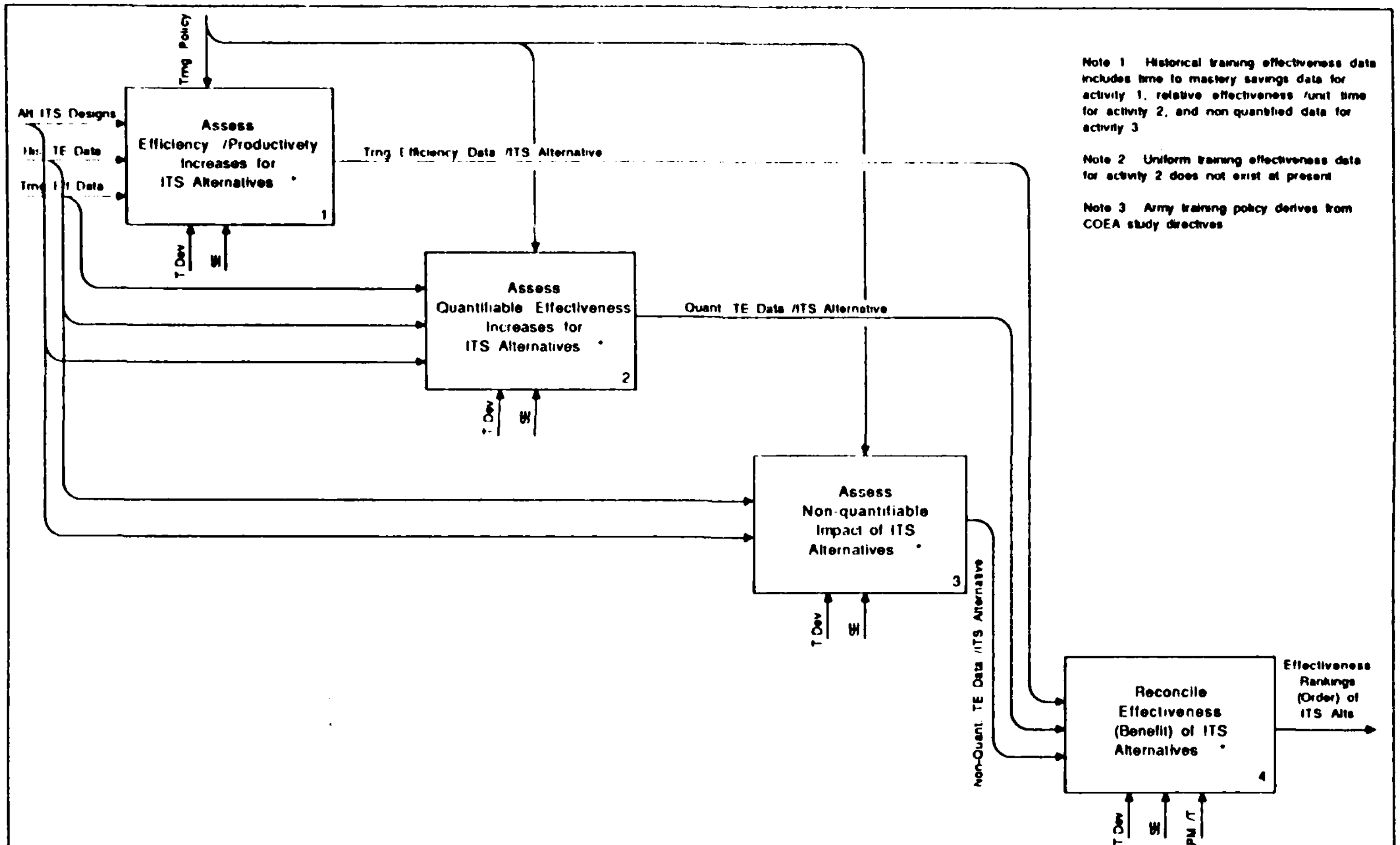

Note 1 Historical training effectiveness data includes time to mastery savings data for activity 1, relative effectiveness /unit time for activity 2, and non quantified data for activity 3

Note 2 Uniform training effectiveness data for activity 2 does not exist at present

Note 3 Army training policy derives from COEA study directives

NODE:	TITLE:	NUMBER:
TRASER A01412 •	Evaluate Effectiveness of Alternative ITS Designs	

TRASER A01412 EVALUATE THE EFFECTIVENESS OF ALTERNATE ITS DESIGNS

The effectiveness of alternative ITS designs must be estimated in order to conduct trade-offs with cost in A01413, CONDUCT TRADE-OFF ANALYSIS AMONG ITS ALTERNATIVES. Effectiveness is defined as a relative gain in performance toward mastery of content for a fixed amount of training time. An optimum measure of training effectiveness is relative positive transfer of training for candidate media. However, such data do not presently exist nor are they likely to exist in the future. For this reason, alternative approaches are offered. One approach is evaluate training efficiency, i.e., the training time saved by alternative media, teaching to fixed level of performance (content mastery). Another is to use non- quantitative measures of effectiveness, such as instructor ratings of relative media effectiveness. Limited data for both latter approaches exist at present. If more than one method is used, the results must be reconciled and processed into a ranked order of ITS alternatives, based on relative effectiveness.

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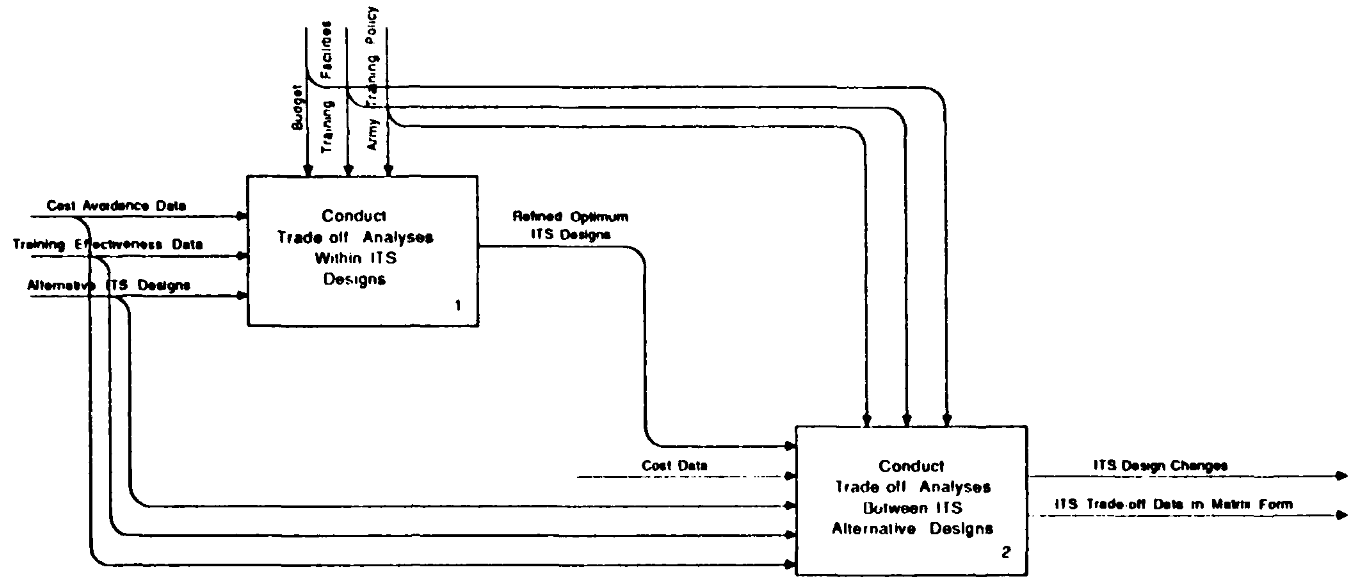

NODE:	TITLE:	NUMBER:
TRASER A01413 •	Conduct Trade-off Analyses Among ITS Alternatives	

TRASER A01413 CONDUCT TRADE-OFF ANALYSES AMONG ITS ALTERNATIVES

Two types of tradeoffs will be conducted. The first type of tradeoff is between different quantities of selected media within one ITS design. For example, this type of tradeoff would evaluate the number of required training aircraft versus the number of optimized combat mission simulator (CMS) required to train to the same training requirements. The second type of tradeoff is between complete ITS designs. In this approach, the advantages and disadvantages of each ITS design will be derived and evaluated to produce data from which a final selection of ITS can be accomplished.

USED AT:	AUTHOR: Feuge	DATE: 1/15/90	WORKING	READER	DATE	CONTEXT:
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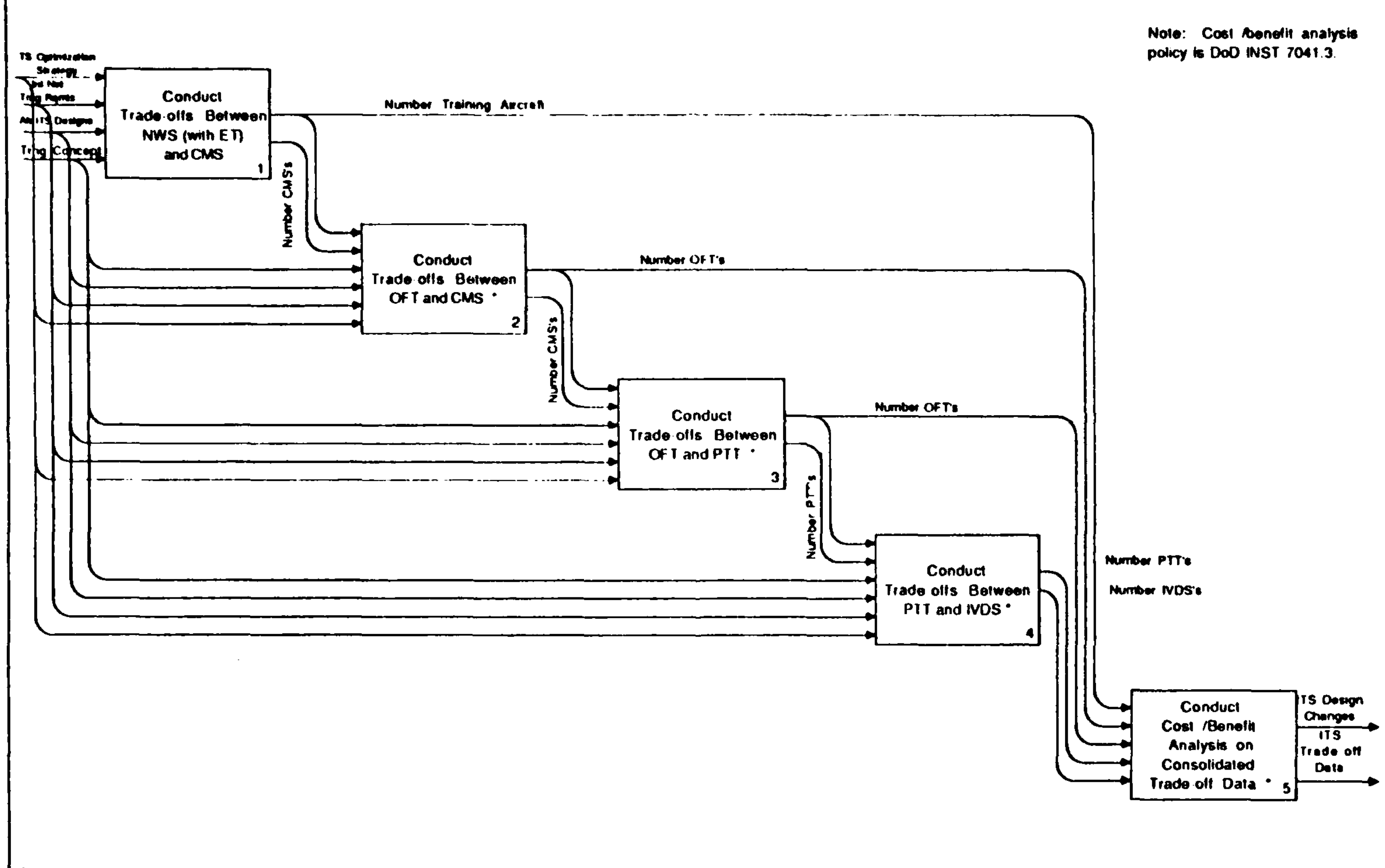
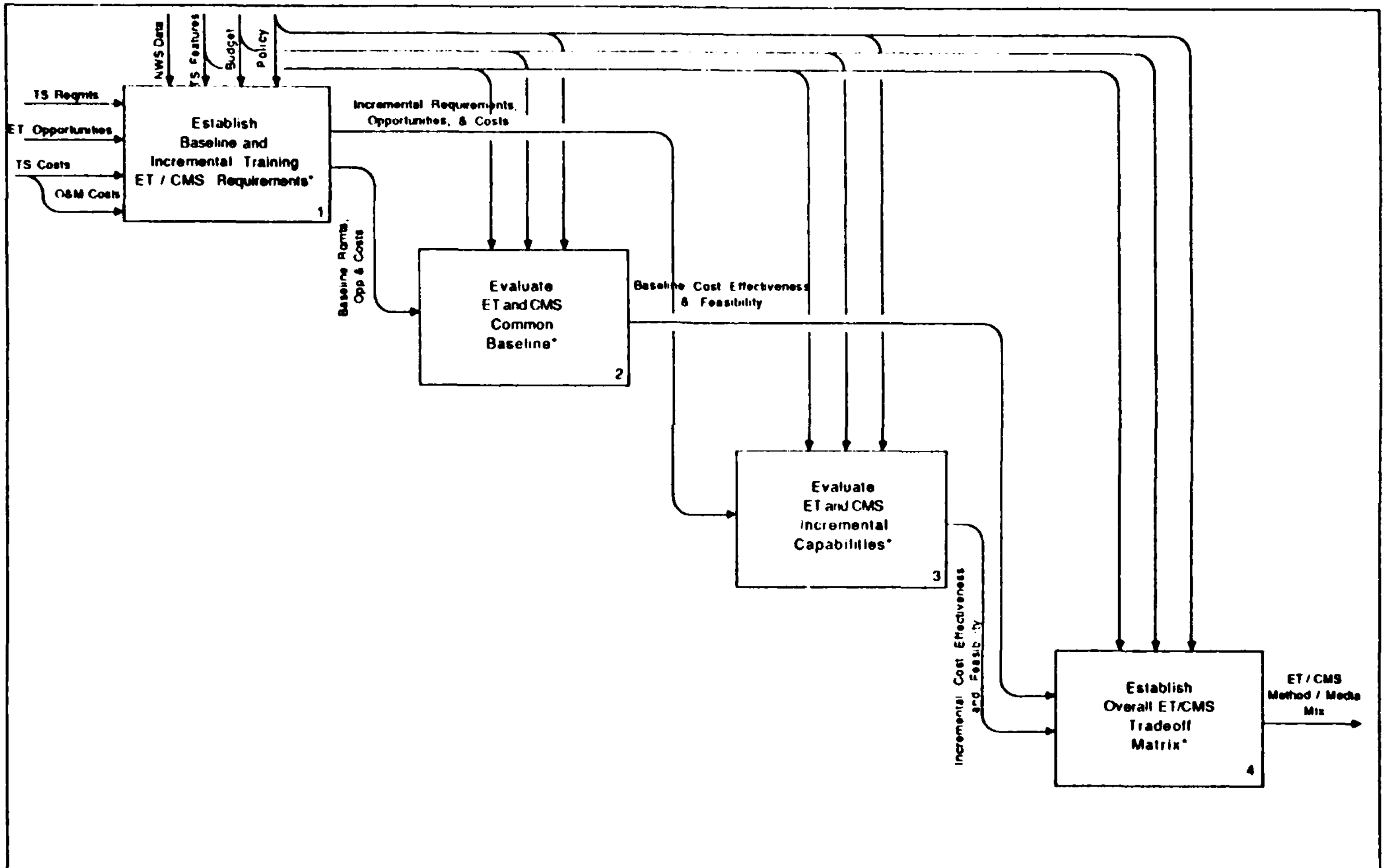


NODE:	TITLE:	NUMBER:
TRASER A014131 *	Conduct Trade-off Analyses Within ITS Alternative Designs	

TRASER A014131 CONDUCT TRADE-OFF ANALYSES WITHIN ITS ALTERNATIVE DESIGNS

A series of potential tradeoffs are outlined which will allow the training developer to refine the optimum ITS design even further. This cascade of tradeoff studies allows the user to implement the Army training policy of shifting the training load to the lowest cost media. The cost and benefit analysis is required by DoDINST 7041.3.

USED AT: Arlington	AUTHOR: Evans DATE 1/12/90 PROJECT: TRASER REV: 1 NOTES: 1 2 3 4 5 6 7 8 9 10	WORKING DRAFT RECOMMENDED PUBLICATION	READER DATE	CONTEXT: A01413



NODE: TRASER A0141311	TITLE: Conduct Trade-offs Between NWS/Embedded Training and Combat Mission Simulator	NUMBER:

TRASER A0141311 CONDUCT TRADEOFFS BETWEEN NWS ET AND COMBAT MISSION SIMULATOR

This activity conducts a tradeoff of costs, technical feasibility, and effectiveness between the NWS ET approach and the current approach for a combat mission simulator. A standard cost-benefit methodology is applied: a comparison is made from a baseline set of common training requirements first, followed by an evaluation of incremental capabilities or the value-added by either approach individually. Updated information on training requirements, opportunities and costs are fed in to establish baseline design conditions. Budget, policy, and the NWS design and mission are constraints to the process. The overall outcome is a matrix of methods and media mixes. Costs include the incremental cost of ET hardware, software, or courseware over that incurred by the prime system or other training alternatives, the O&M and logistics costs of using the device in a training mode, and access costs (costs to travel to the device). Effectiveness measures include the fidelity of training provided with respect to combat conditions, the device's capacity to train (numbers of soldiers and the duration of training exercises), the suitability to training specific skills (acquisition, cross-over, sustainment), and the ease of use (Is it strap-on?; Do soldiers have to travel to use it?). While not specifically outlined in this process, the nature of the training provided by ET may also necessitate a tradeoff analysis with other training component design options, such as stand-alone devices.

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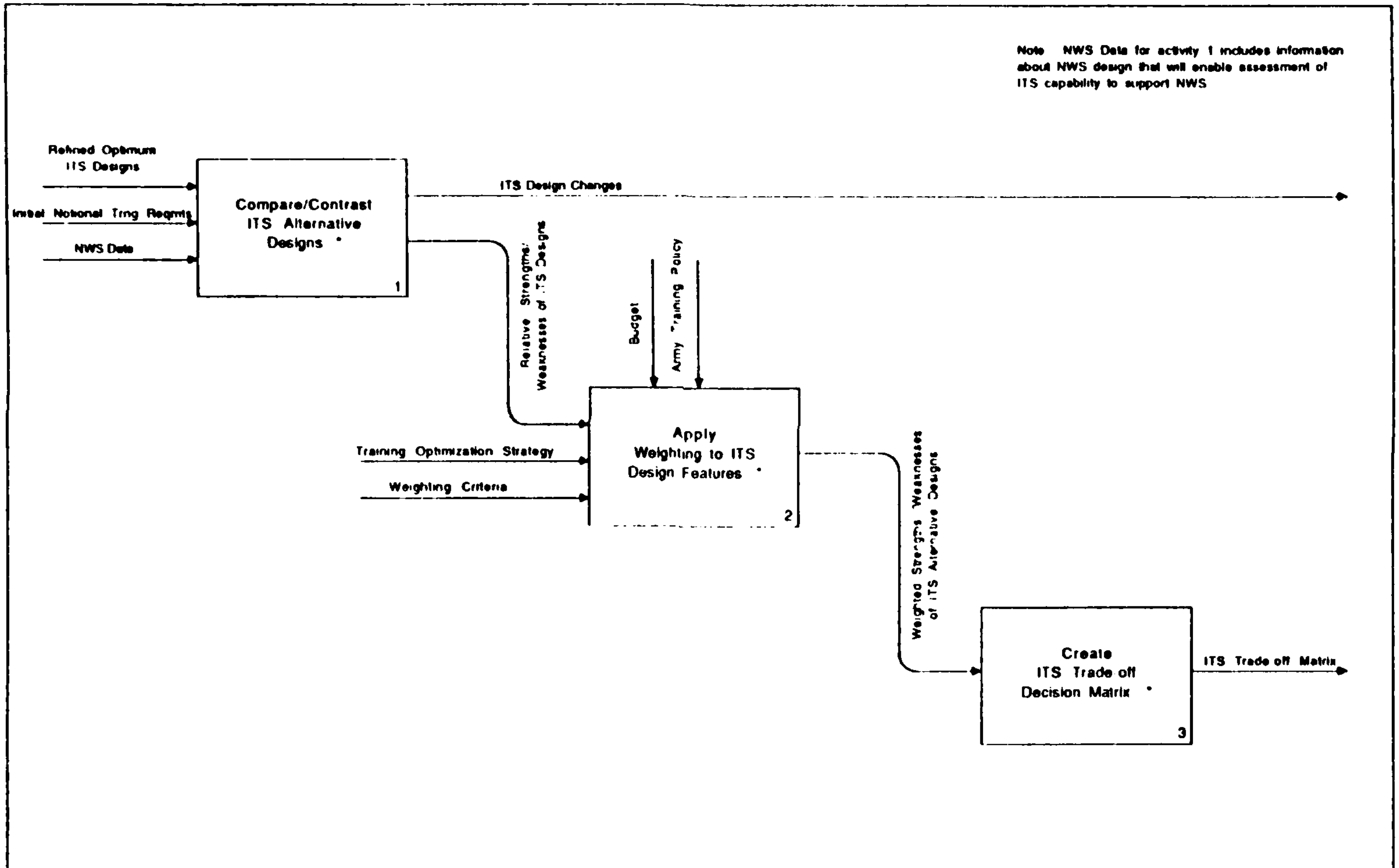

NODE:	TITLE:	NUMBER:
TRASER A014132 •	Conduct Trade-off Analyses Between ITS Alternative Designs	

TRASER A014132 CONDUCT TRADEOFF ANALYSES BETWEEN ITS ALTERNATIVE DESIGNS

In this activity, the alternative ITS designs are carefully evaluated against the initial notional training requirements to establish relative strengths and weaknesses of the designs. A weighting system is applied to the strengths and weaknesses, based on the dictates of Army training policy and the Optimization Strategy. The output is formed into a decision matrix which serves as input to the selection process.

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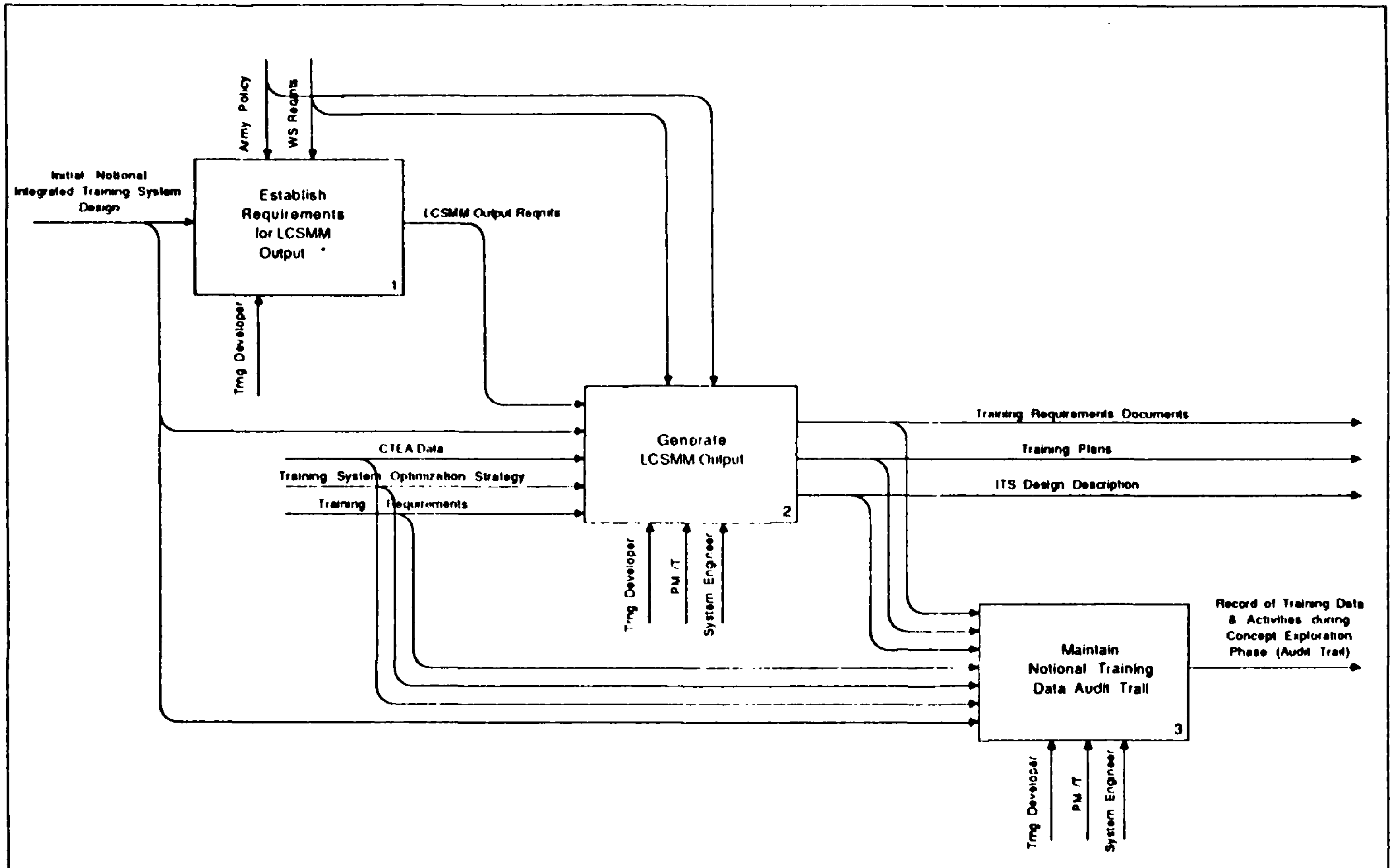

NODE:	TITLE:	NUMBER:
TRASER A015	Produce LCSMM Training Output	

TRASER A015 PROCDUCE LCSMM TRAINING OUTPUT

This activity has been subdivided into three activities. The first activity establishes requirements for the various LCSMM outputs that must be created during the Concept Exploration phase, based on Army regulations and weapon system program requirements. The second activity is to generate the various LCSMM outputs on schedule and in accordance with LCSMM requirements. The last activity is required to maintain an audit trail of both the initial training system design and all of the decisions and assumptions used to determine that design.

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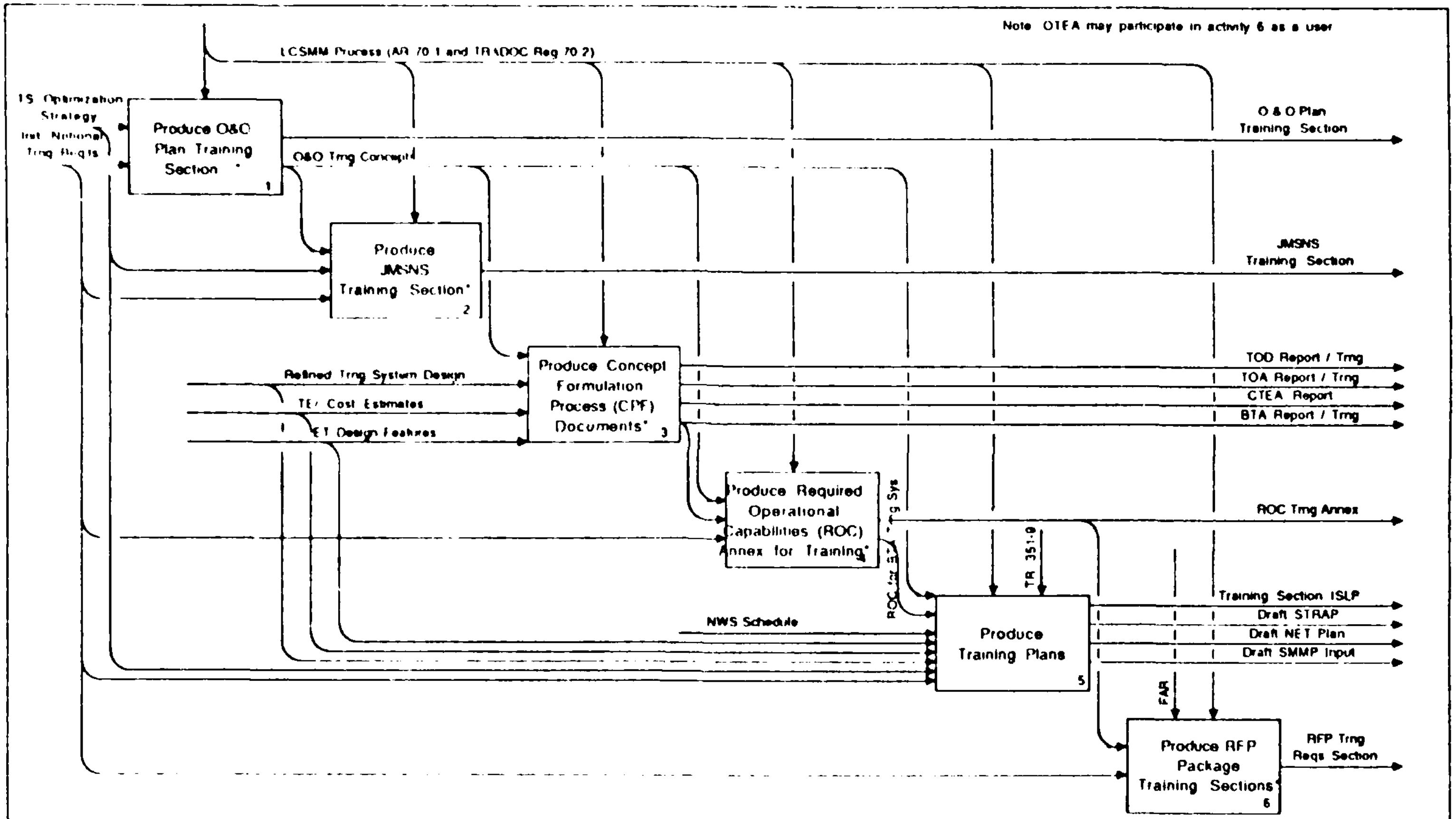
CONTEXT: A015				



NODE: TRASER A0152	TITLE: Generate LCSMM Training Output	NUMBER:

TRASER A0152 GENERATE LCSMM TRAINING OUTPUT

This activity creates the major LCSMM training outputs during the concept formulation phase of weapon system development. The initial drafts of ILSP, the STRAP, the NET and the SMMP are produced and serve as the first cut of these training plans for the remainder of the weapon system life cycle. This activity also produces the training concept formulation package documents, the Trade-off Determination Report, the Trade-off Analysis Report, the Cost and Training Effectiveness Analysis and the Best Technical Approach Report.

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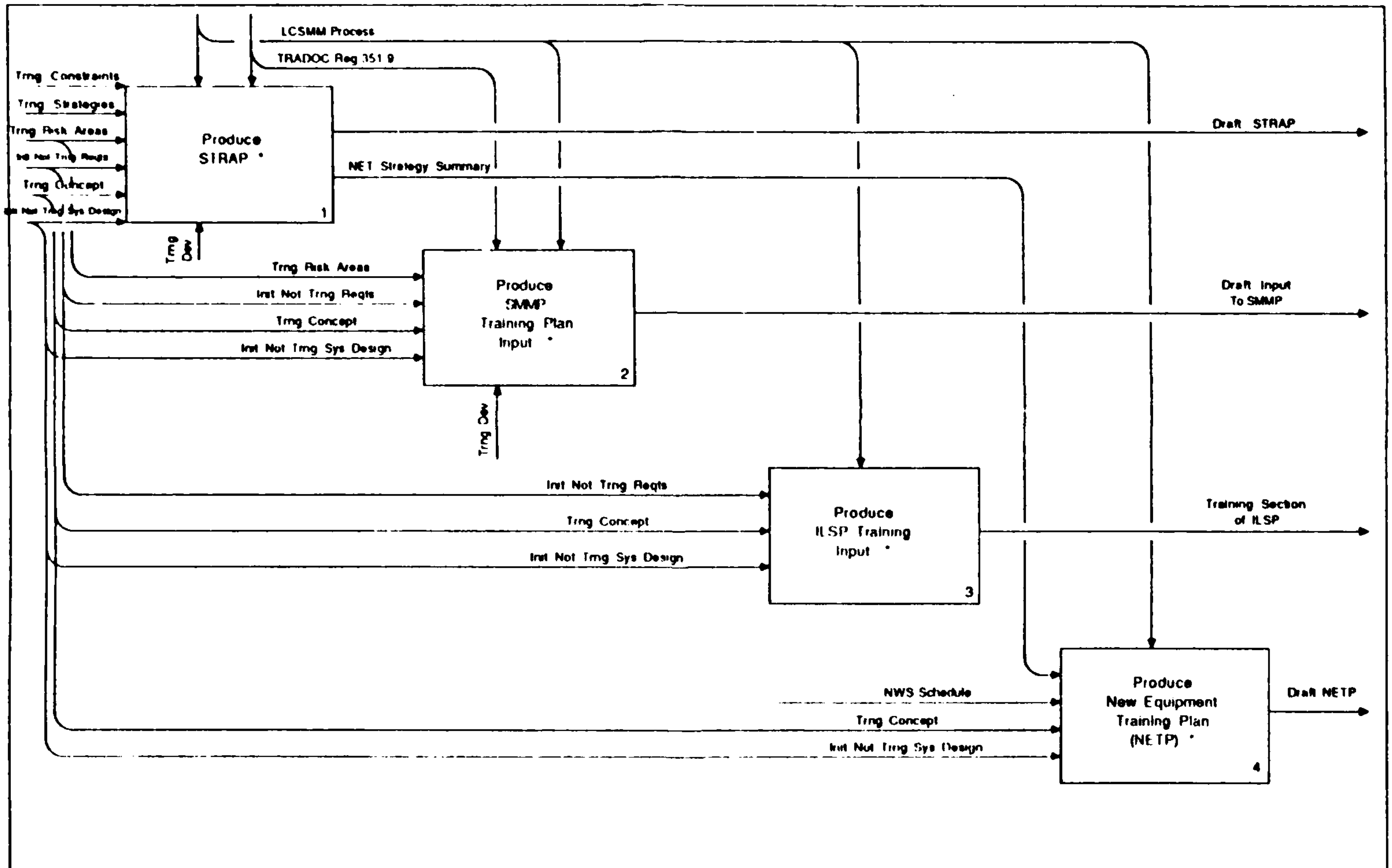

NODE:	TITLE:	NUMBER:
TRASER A01525	Produce Training Plans	

TRASER A01525 PRODUCE TRAINING PLANS

This activity produces the draft training plans that have major impact over the life cycle of the weapon system. The System MANPRINT Management Plan serves as the repository of human factors information and target audience description for the evolution of the training system. The draft New Equipment Training Plan serves as the first cut of a training system for delivery with the new equipment. The STRAP aids TRADOC in coordinating the management of its training resources.

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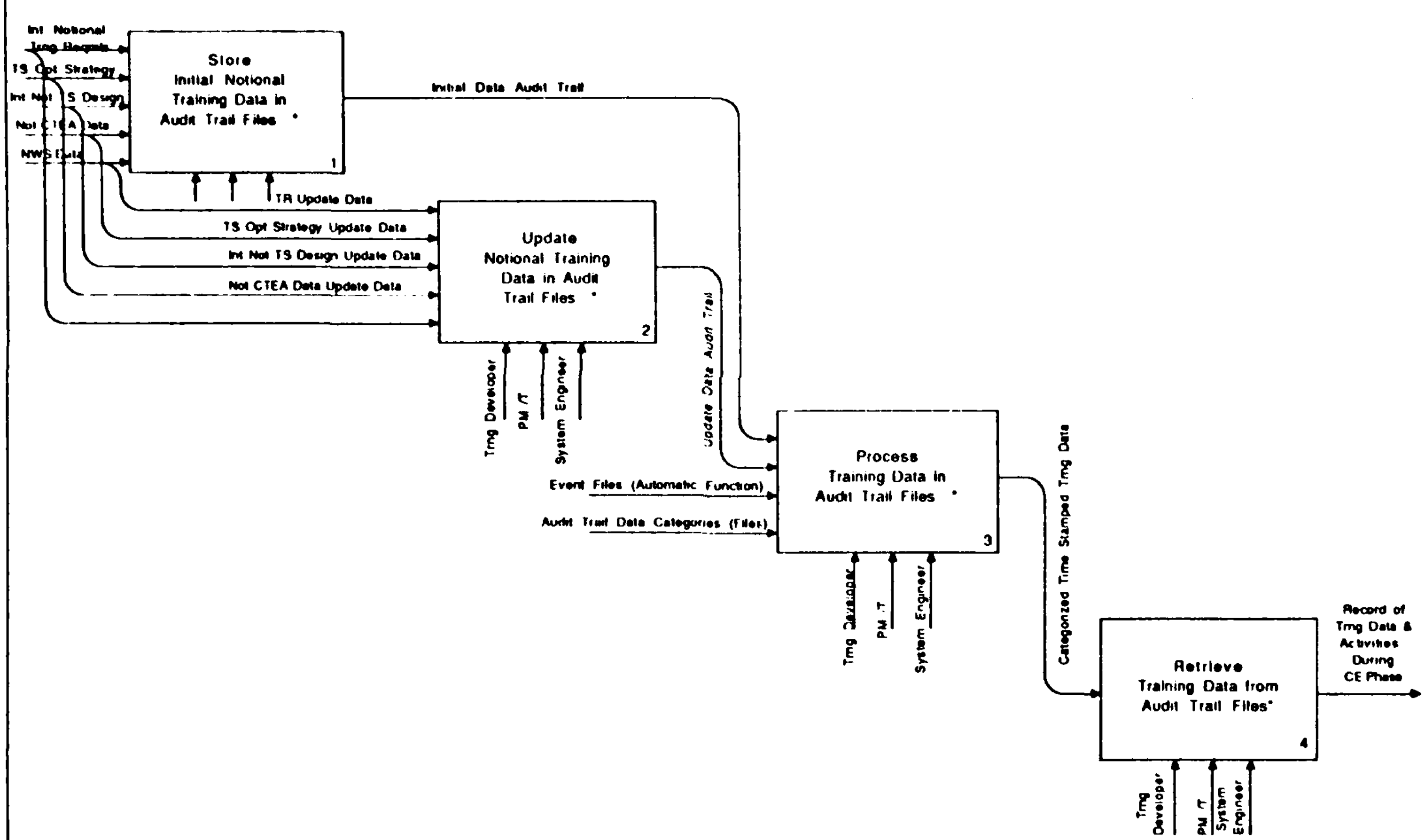

NODE:	TITLE:	NUMBER:
TRASER A0153 *	Maintain Notional Training Data Audit Trail	

TRASER A0153 MAINTAIN NOTIONAL TRAINING DATA AUDIT TRAIL

In response to AMAA recommendations, this activity creates the requirement to establish and maintain an audit trail of critical training system results. This routine, new to Army training system development, will automatically capture and date all training output emanating from TRASER. It will enable the user to process, sort, and retrieve training data through an audit trail program.

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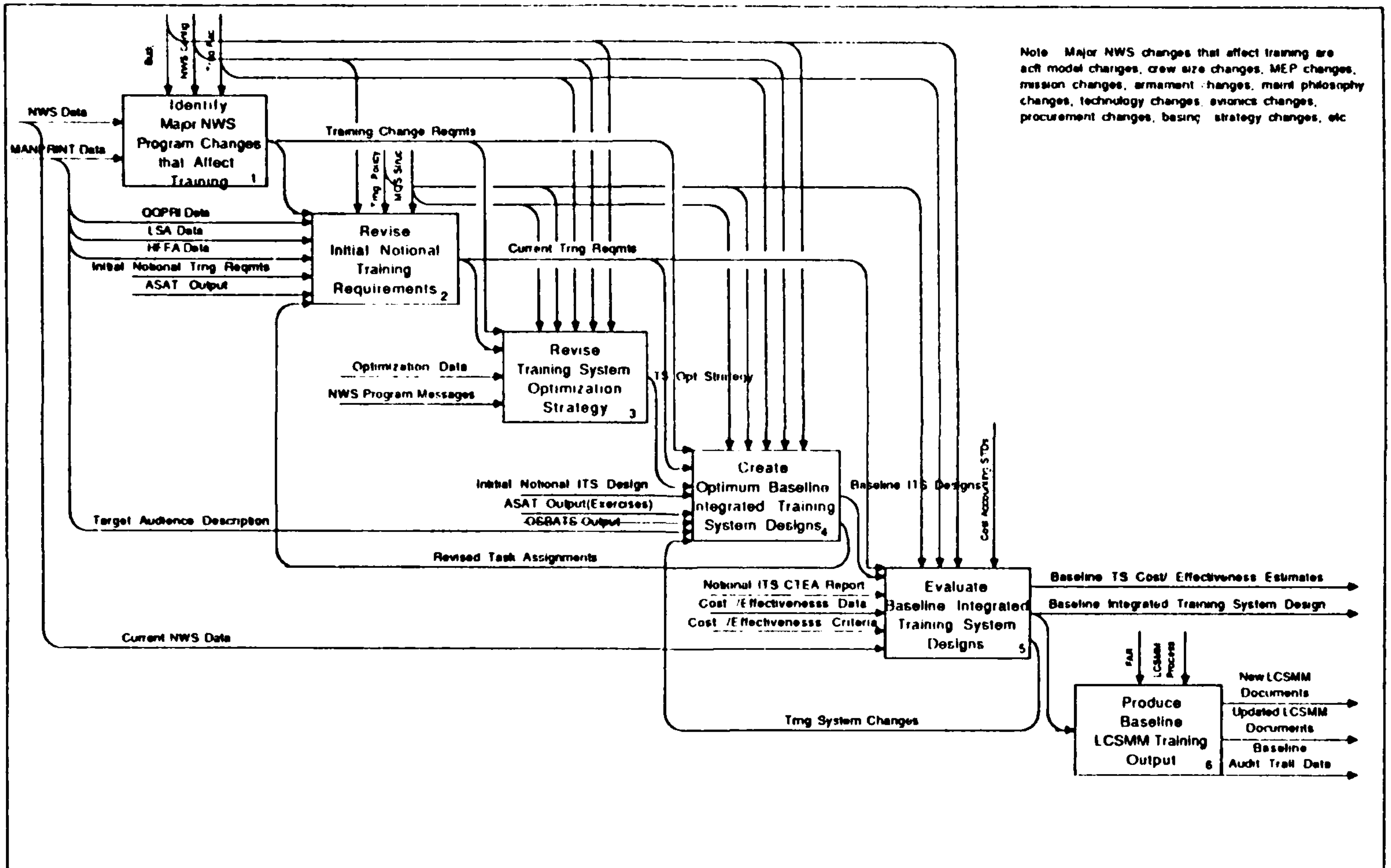

NODE:	TITLE:	NUMBER:
TRASER A02	Refine Baseline Integrated Training System Design	

TRASER A02 REFINE BASELINE INTEGRATED TRAINING SYSTEM DESIGN

In this activity, the initial notional integrate training system (ITS) is refined into a baseline integrated training system for all NWS MOSs. Where the notional ITS was based mostly on historical data from previous similar training systems, the baseline system is based more on analytic data about the NWS. However, the initial notional ITS is not thrown away but transformed into the baseline ITS by supplanting notional data and concepts with more current data and concepts. As part of this process, the training requirements, optimization strategy, training system designs, and supporting data are all updated or supplanted so that the LCSMM output for training is as current as it possibly can be at Milestone II. The results of this step set the stage for entry into Full Scale Development where an ITS will be procured to support training in FSD and eventually production.

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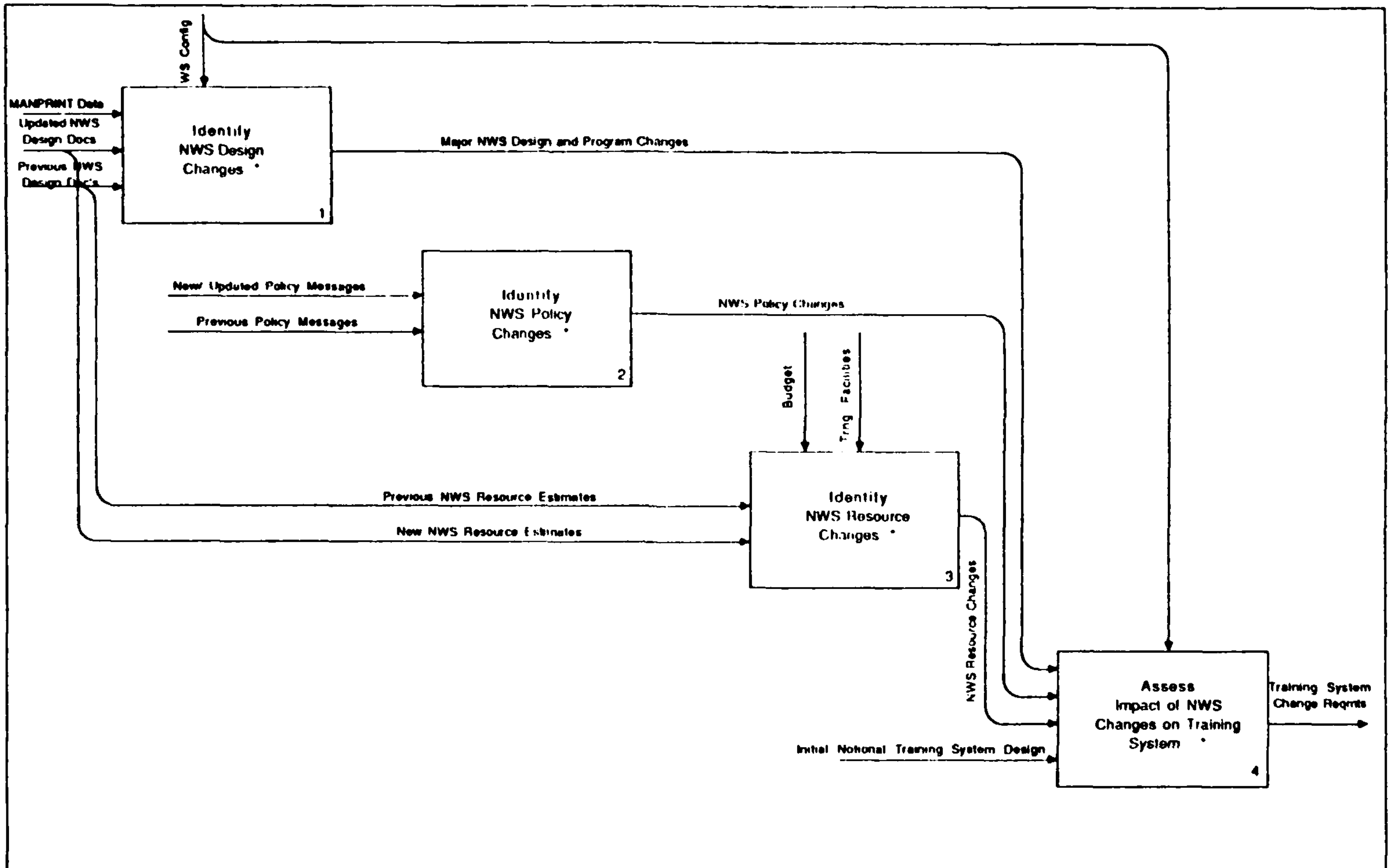

NODE:	TITLE:	NUMBER:
TRASER A021 *	Identify Major NWS Program Changes that Affect Training	

TRASER A021 IDENTIFY MAJOR NWS PROGRAM CHANGES THAT AFFECT TRAINING

In this activity, major changes in NWS design, policy, and resources are identified and their impact on training is established. These changes to the NWS program have the potential to drastically alter the initial notional ITS concept, therefore they must be carefully evaluated before the baseline ITS design is produced and evaluated.

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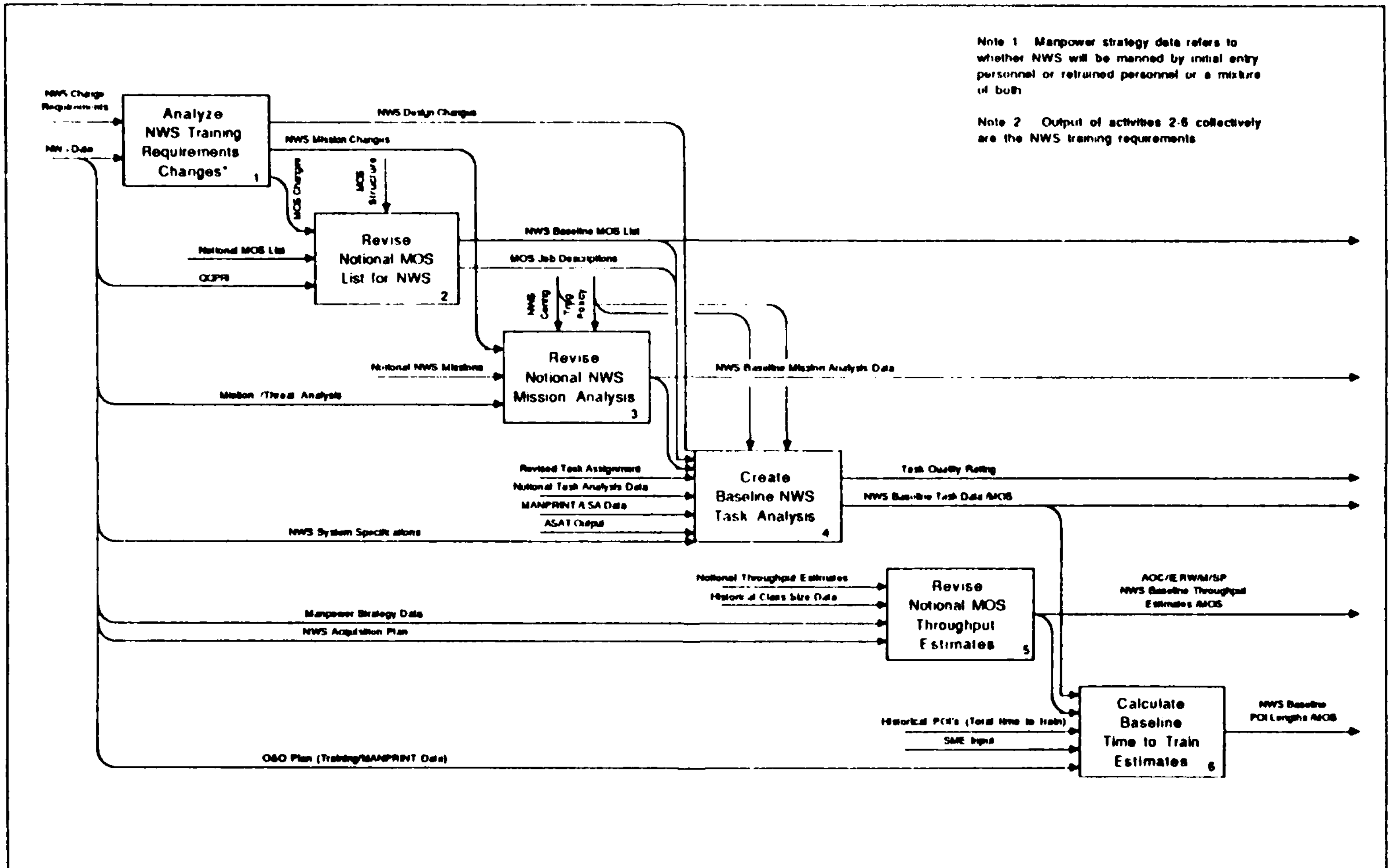

NODE: TRASER A022	TITLE: Revise Initial Notional Training Requirements	NUMBER:

TRASER A022 REVISE INITIAL NOTIONAL TRAINING REQUIREMENTS

In this activity, the most current NWS program data and data sources will be used to revise the initial notional training requirements. This process includes revising the list of MOSs to be trained, missions (based on current information about the threat), MOS tasks (collective, individual, and integration), throughput estimates, and time to train estimates which correspond roughly with total training time. These training requirements will established for all MOSs, including operators, maintainers, and support personnel in the NWS.

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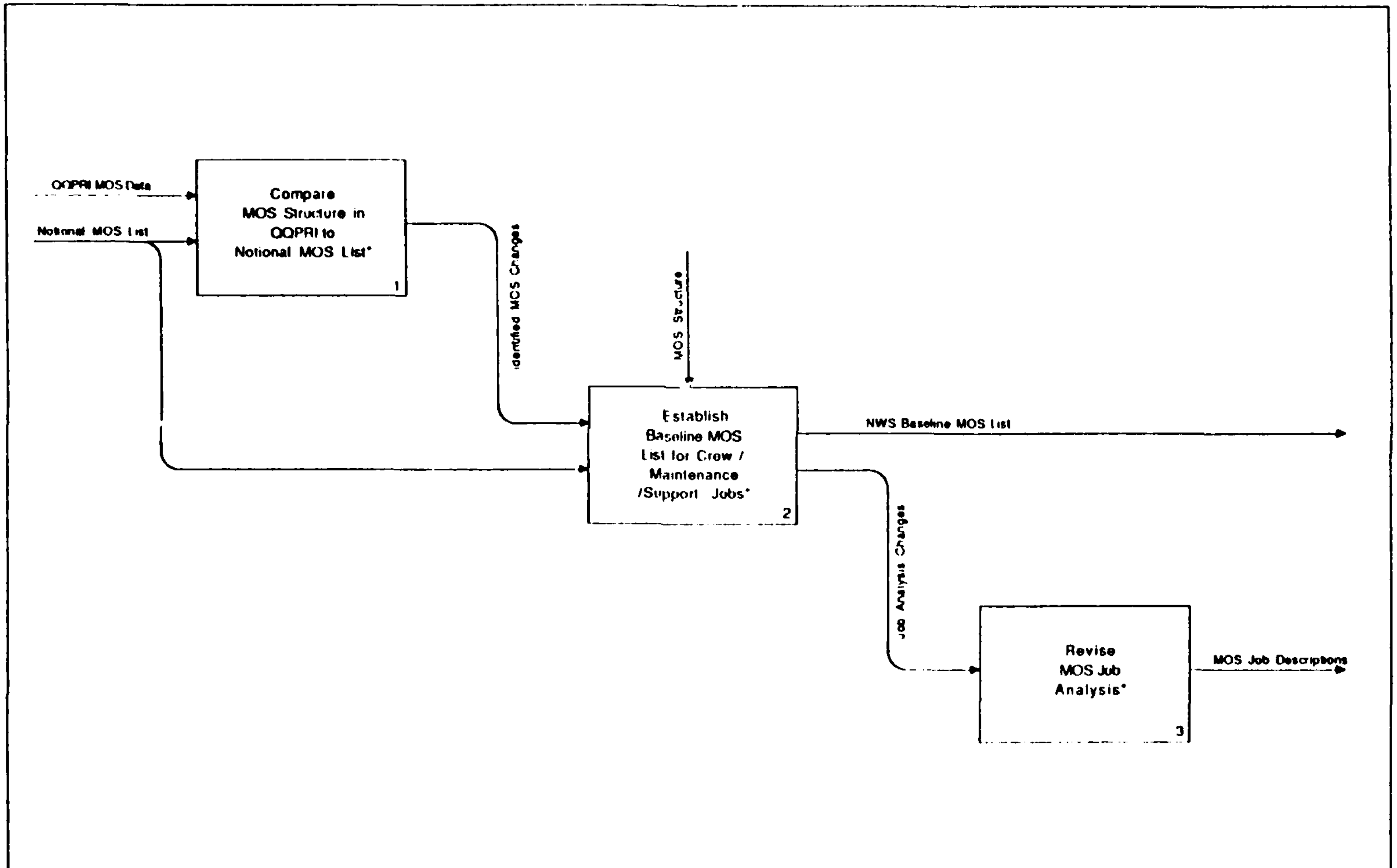

NODE:	TITLE:	NUMBER:
TRASER A0222 •	Revise Notional MOS List for NWS	

TRASER A0222 REVISE NOTIONAL MOS LIST FOR NWS

The purpose of this portion of the TRASER architecture is to take into account any changes in MOSs or MOS job activities that are reported in the Quantitative Qualitative Personnel Requirements Information (QQPRI). The QQPRI is the definitive document regarding MOSs to be assigned to the NWS and in initially produced during the Demonstration and Validation Phase between Milestone I and Milestone II. The data from the QQPRI will completely supplant the notional MOS List developed in A01121, IDENTIFY ALL NWS NOTIONAL MOS'S.

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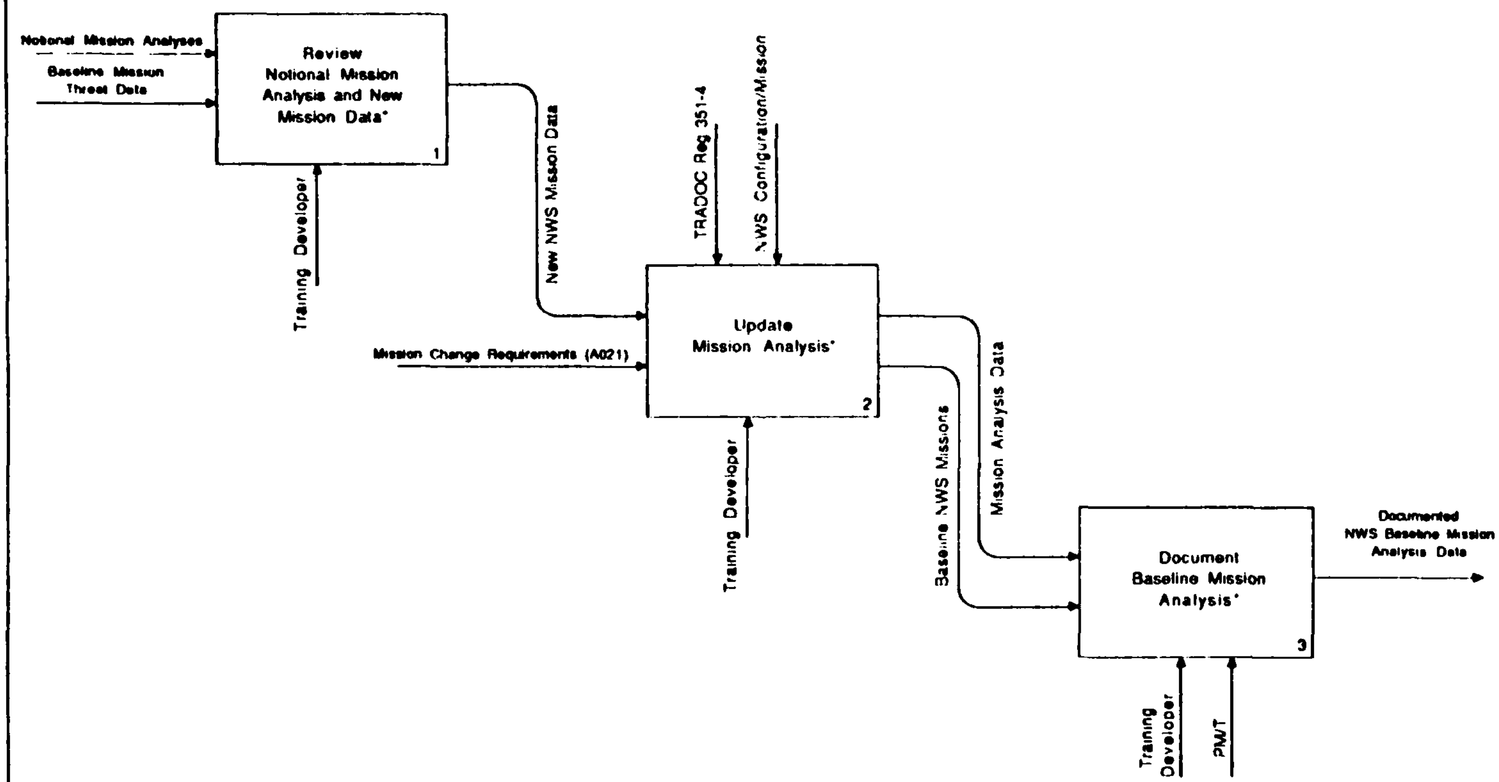

NODE:	TITLE:	NUMBER:
TRASER A0223	Revise Notional NWS Mission Analysis	

TRASER A0223 REVISE NOTIONAL NWS MISSION ANALYSIS

In this activity, the previous mission analysis (not to be confused with the Mission Area Analysis (MAA)) is updated to reflect more current information about the threat that the NWS is designed to offset. This is an important step in that subsequent function and task analyses will use the missions stated in this activity as the start point, giving the analyses a true top down approach.

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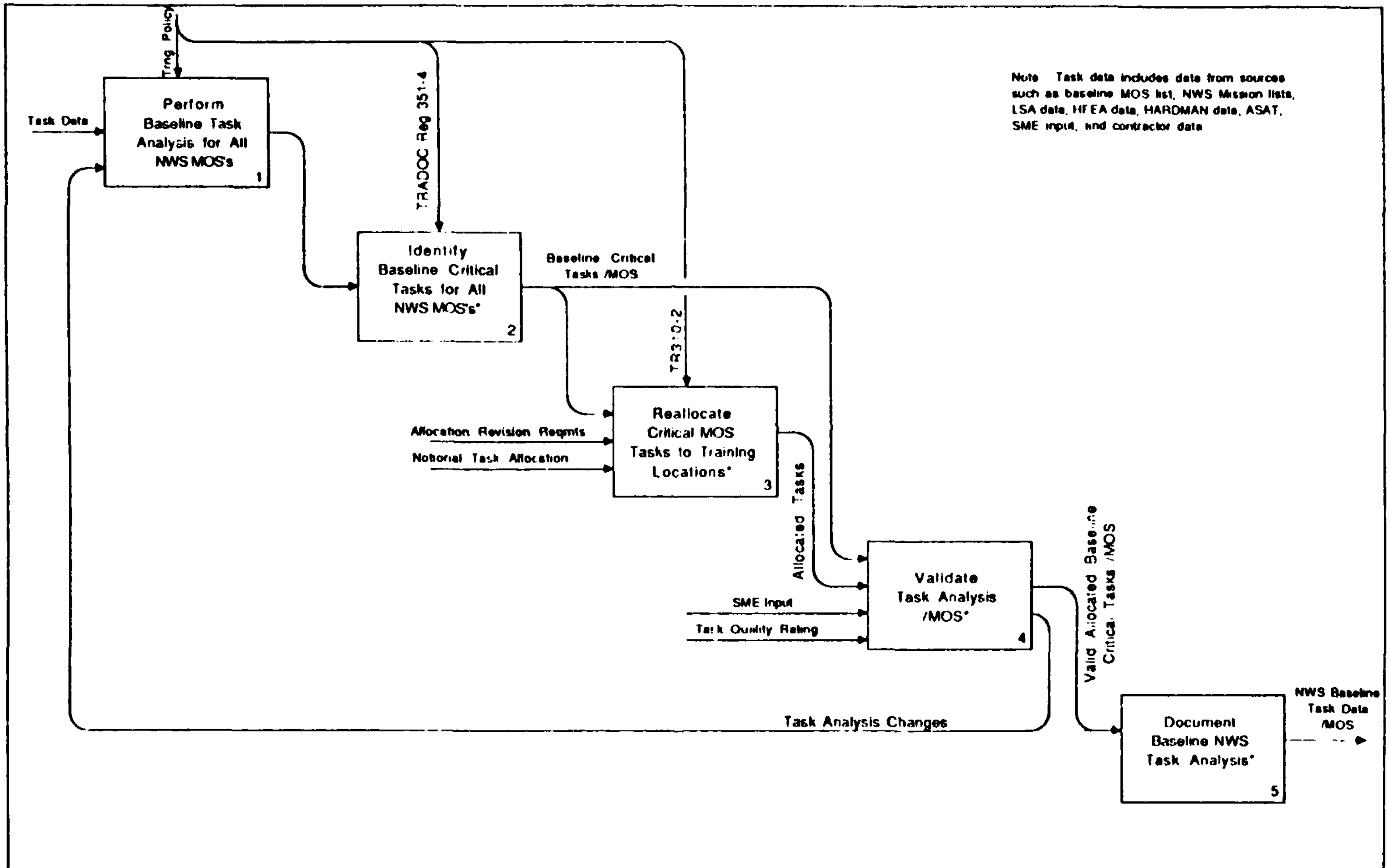
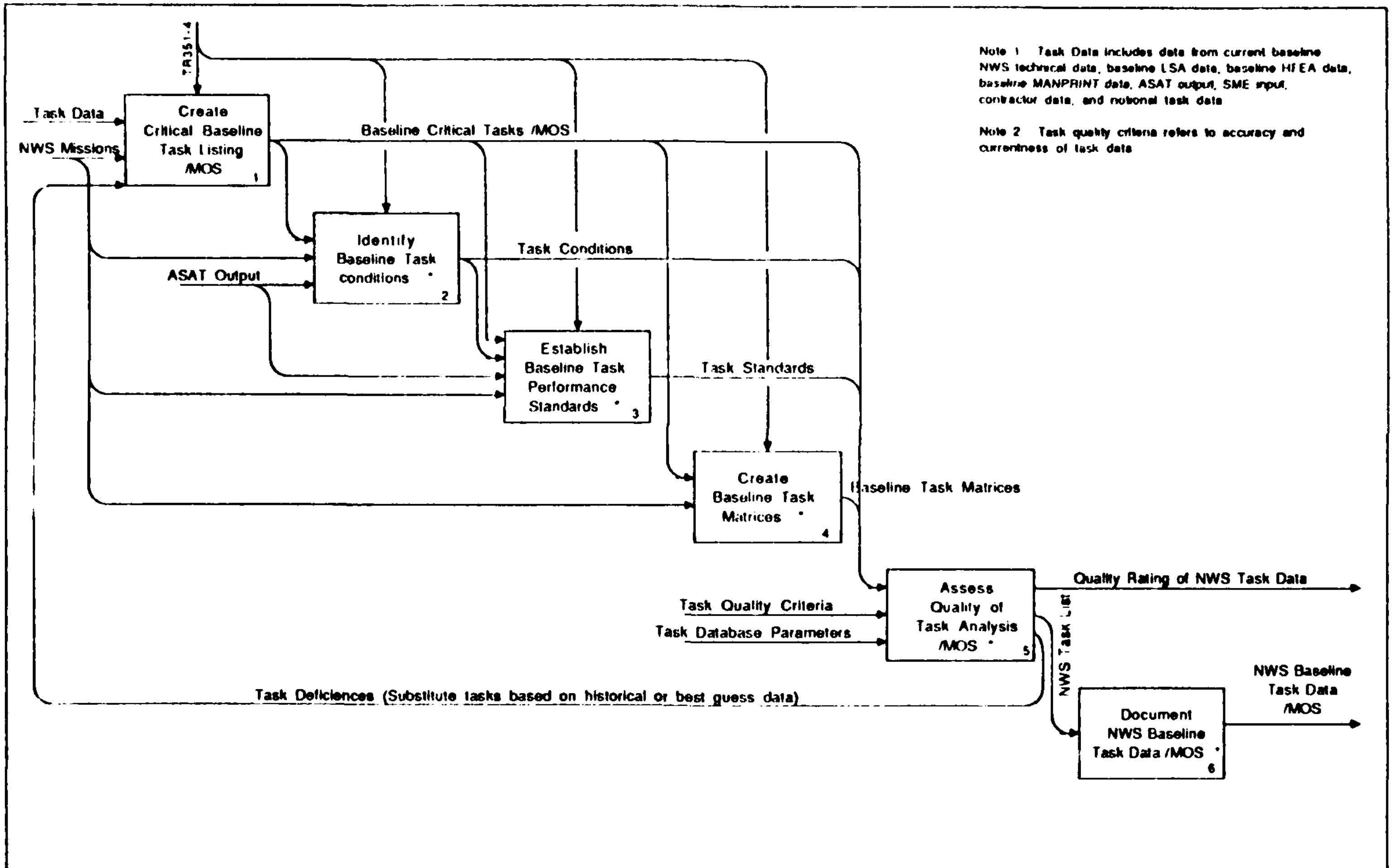


NODE:	TITLE:	NUMBER:
TRASER A0224	Create Baseline NWS Task Analysis	

TRASER A0224 CREATE BASELINE NWS TASK ANALYSIS

For the MOSs identified in A0222, REVISE NOTIONAL MOS LIST FOR NWS, and the missions identified in A0223, REVISE NOTIONAL NWS MISSION ANALYSIS, a new baseline task analysis will be performed and checked against the initial notional task analysis performed in the concept exploration phase (prior to Milestone I). This analysis will follow the systems approach the training (SAT) methodology, using current NWS documentation and NWS subject matter experts (SME) as data sources. This approach differs from the approach used in concept exploration where little was known about the true design of the NWS. There, in lieu of documents and SME, historical data were uncovered and used as "straw-man models" until the SAT analysis could be performed. As with the previous analysis, task data are also allocated to either institution or unit levels of training in this activity. Task data are also validated in this activity.

USED AT: San Diego	AUTHOR: Feuge PROJECT: TRASER NOTES: 1 2 3 4 5 6 7 8 9 10	DATE: 1/15/90 REV: 2		WORKING DRAFT RECOMMENDED PUBLICATION	READER	DATE	CONTEXT: A0224



NODE: TRASER A02241	TITLE: Perform Baseline Task Analysis for All NWS MOS's	NUMBER:

TRASER A02241 PERFORM BASELINE TASK ANALYSIS FOR ALL NWS MOSs

In this activity, combined arms, collective, and individual tasks are identified for each MOS assigned to the NWS as well as task conditions and standards. Task matrices are produced to provide a cross-index between missions, tasks, and echelons. In addition, a novel step is included which requires the assessment of the quality of the task data be used. This step ensures that the final task listing per MOS will contain only current NWS information, and not historical task data.

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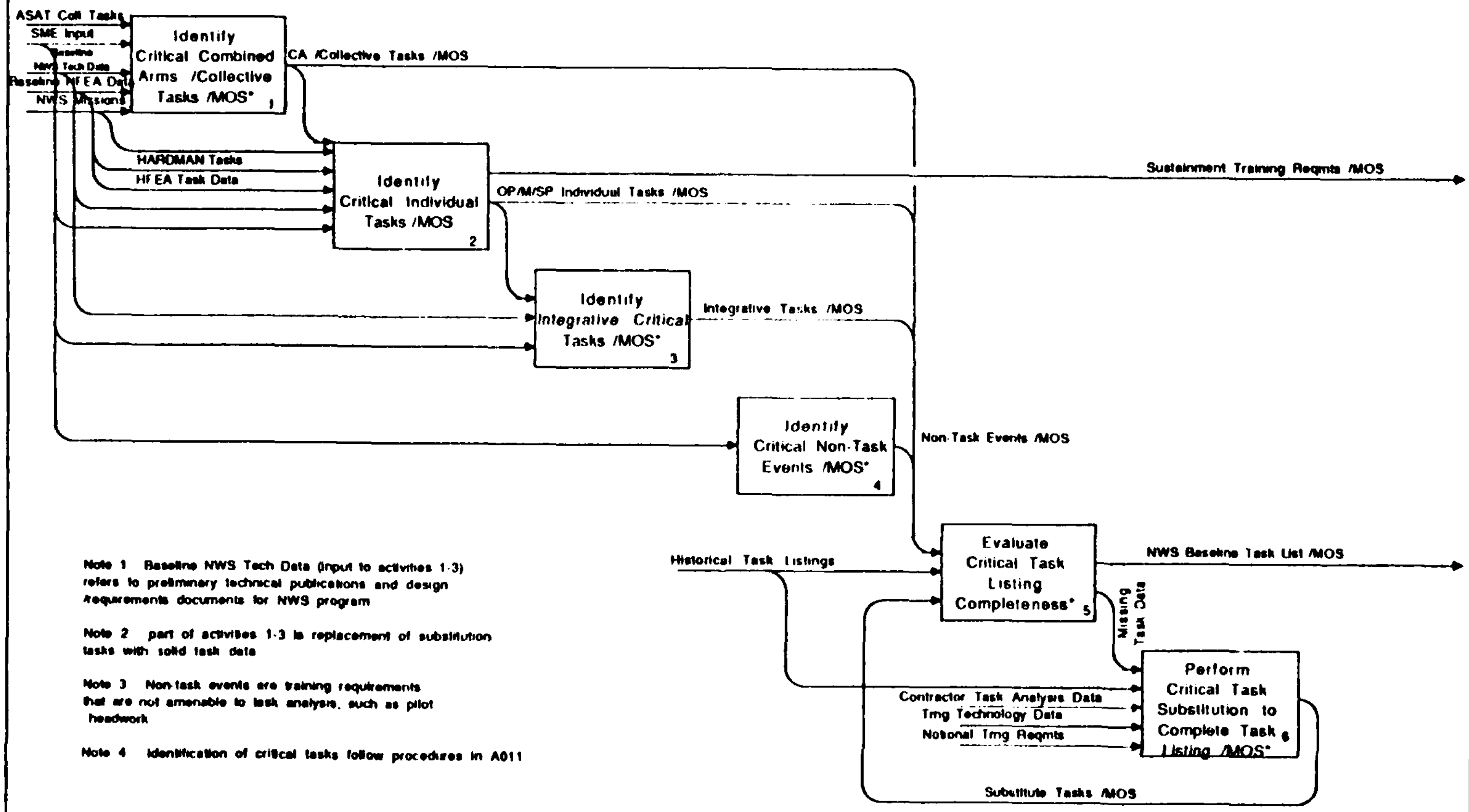

Note 1 Baseline NWS Tech Data (input to activities 1-3) refers to preliminary technical publications and design requirements documents for NWS program

Note 2 part of activities 1-3 is replacement of substitution tasks with solid task data

Note 3 Non-task events are training requirements that are not amenable to task analysis, such as pilot headwork

Note 4 Identification of critical tasks follow procedures in A011

NODE:	TITLE:	NUMBER:
TRASER A022411	Create Baseline Critical Task Listing /MOS	

TRASER A022411 CREATE BASELINE CRITICAL TASK LISTING FOR EACH MOS

The task listing will be completed with data from many sources, including ASAT, MANPRINT (LSA, HFEA, HARDMAN), SME, and NWS documentation sources. As outlined in TRADOC Reg 351-4, combined arms tasks, collective tasks, individual tasks, and integrative tasks, are identified for all operator, maintainer, and support personnel MOSs. These task listings will be constantly reviewed to ensure that they are complete and valid. Only where necessary, tasks from non-analytic sources will be substituted or injected into the task listing to achieve completeness. Such injections will be assessed in the quality rating in A022415, ASSESS QUALITY OF CURRENT ANALYSIS DATA FOR EACH MOS.

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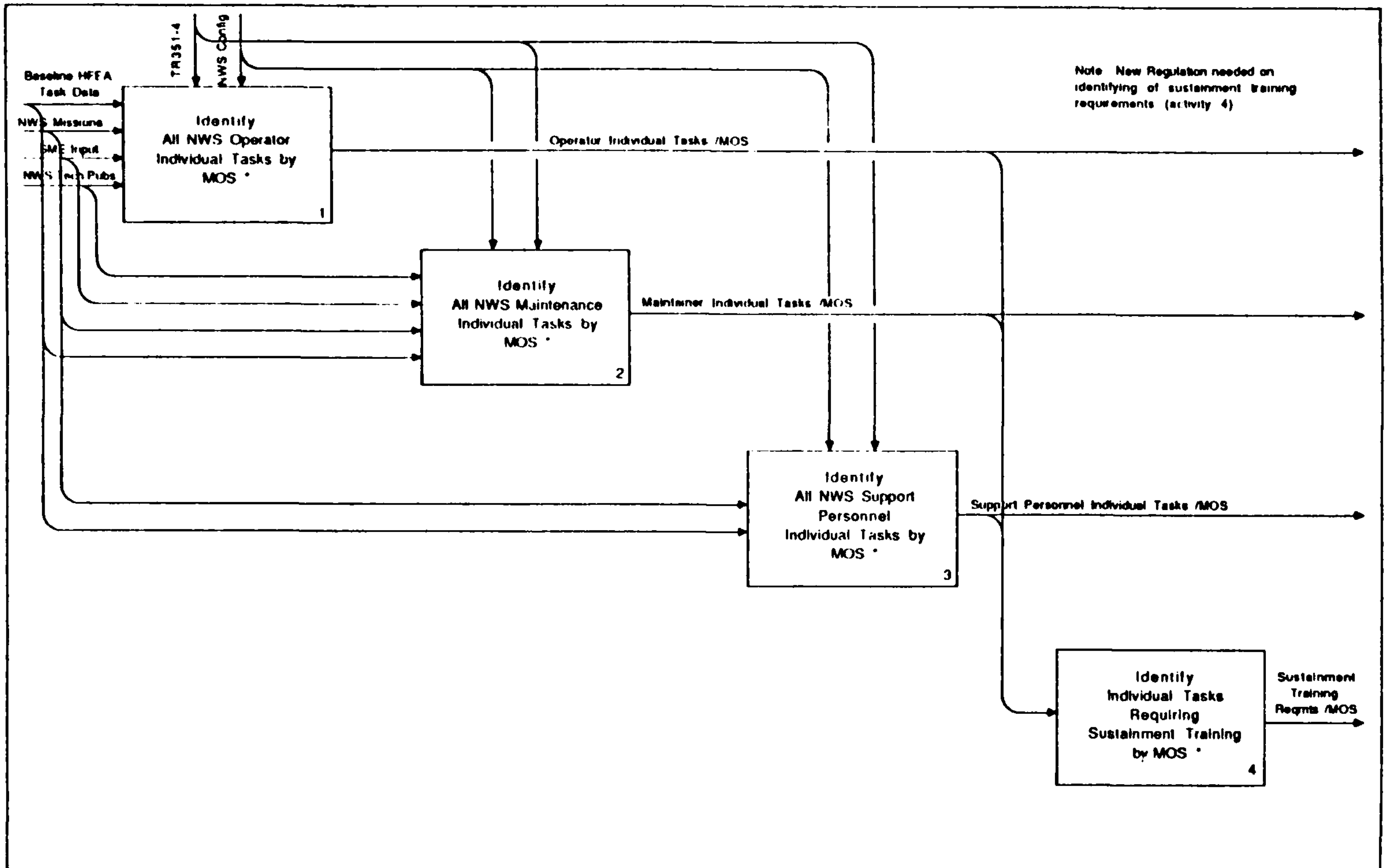
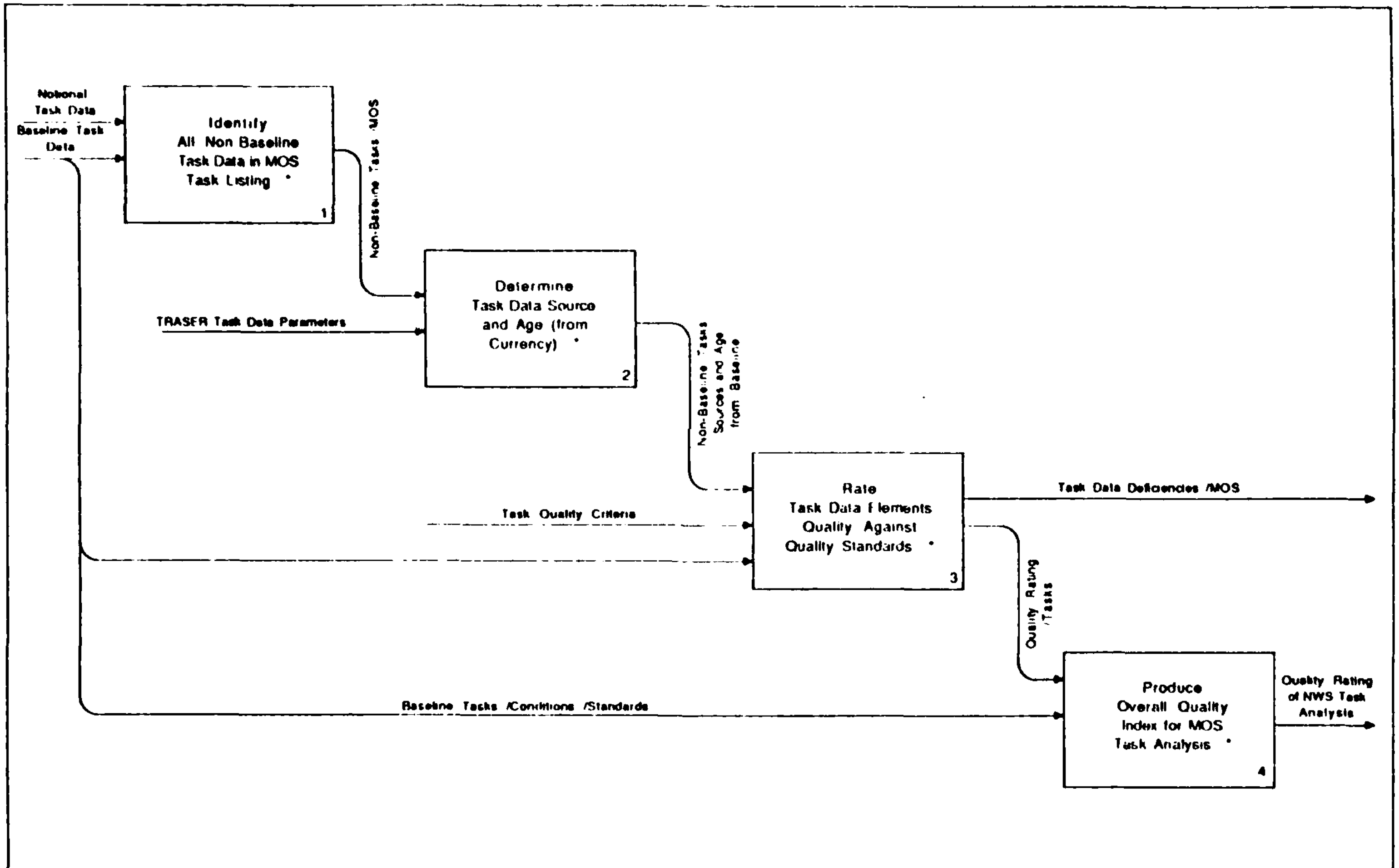


NODE: TRASER A0224112 | TITLE: Identify Critical Individual Task /MOS | NUMBER:

TRASER A0224112 IDENTIFY INDIVIDUAL TASKS FOR EACH MOS

In this activity, individual tasks for operators, maintainers, and support personnel are identified, using different data sources. A key aspect of this activity is identification of individual MOS tasks that will require sustainment training in the units.

USED AT: San Diego	AUTHOR: Feuge PROJECT: TRASER NOTES: 1 2 3 4 5 6 7 8 9 10	DATE: 1/15/90 REV: 1		WORKING DRAFT RECOMMENDED PUBLICATION	READER DATE	CONTEXT: A02241



NODE: TRASER A022415 *	TITLE: Assess Quality of Current Task Analysis Data /MOS	NUMBER:

TRASER A022415 ASSESS QUALITY OF CURRENT TASK ANALYSIS DATA FOR EACH MOS

In this novel activity, the training developer will be required to assess the quality of the task data being used in training system development. It is anticipated that this process could be automated in the TRASER database, using percentage breakdowns of baseline and notional tasks, conditions, and standards as the basis.

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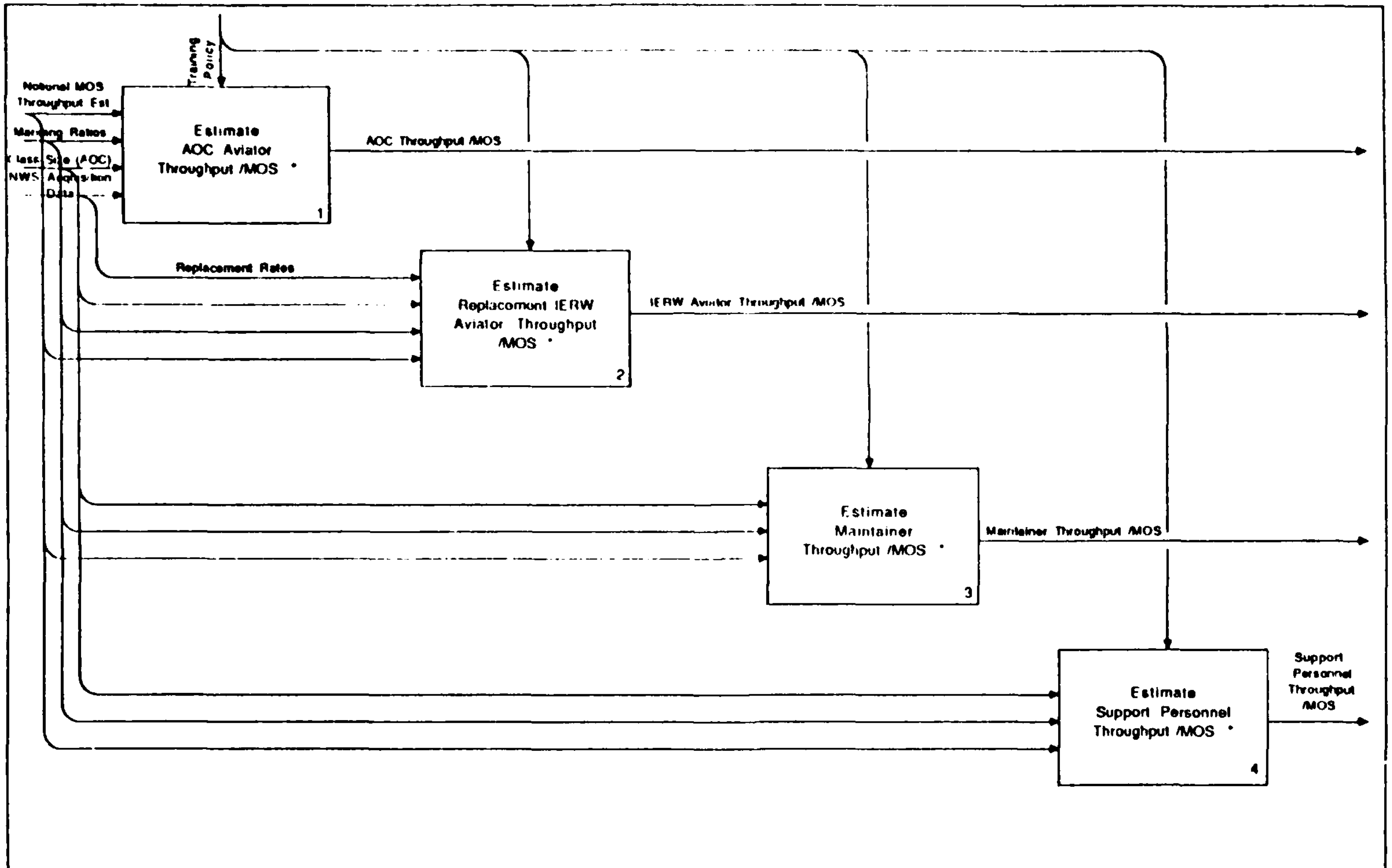

NODE:	TITLE:	NUMBER:
TRASER A0225	Revise Notional MOS Throughput Estimates	

TRASER A0225 REVISE NOTIONAL MOS THROUGHPUT ESTIMATES

One of the key training requirements is the number of students in each MOS and career field that the new training system must train per year. This will include AOC and IERW students as well ASI requirements for maintenance personnel and support personnel. While category labels, such as IERW, are aviation specific, this function of performing an estimate of throughput for each MOS is necessary for any weapon system type.

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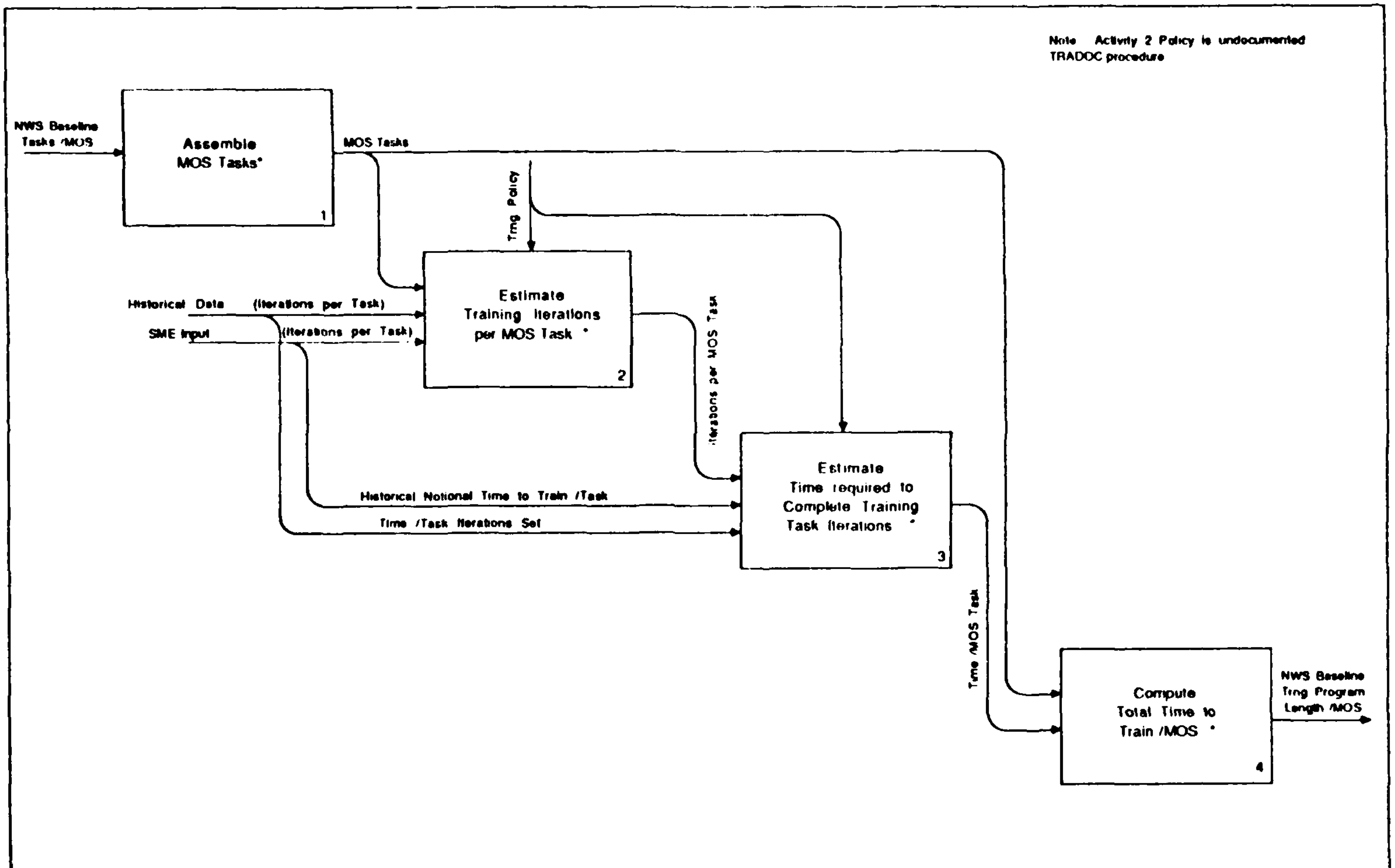

NODE:	TITLE:	NUMBER:
TRASER A0226	Calculate Baseline Time to Train Estimates	

TRASER A0226 CALCULATE BASELINE TIME TO TRAIN ESTIMATES

In this activity, the training developer must establish how long training will take for each MOS. This step is essential to later steps that require the identification of potential new facilities for the new training system. The step relies heavily on SME estimation of iterations per task and time per iteration to arrive a estimates of course lengths.

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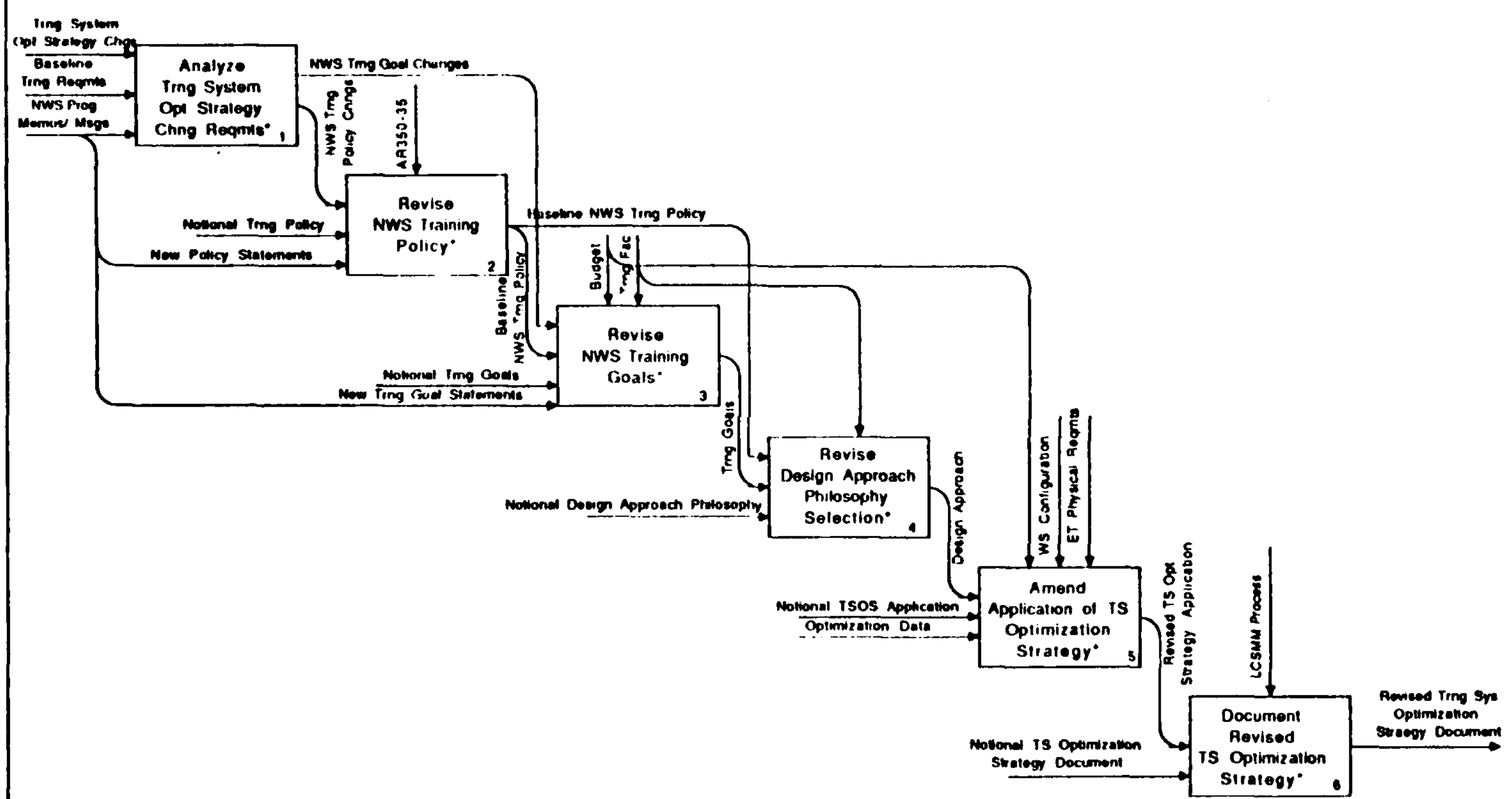

NODE:	TITLE:	NUMBER:
TRASER A023 *	Revise Training System Optimization Strategy	

TRASER A023 REVISE TRAINING SYSTEM OPTIMIZATION STRATEGY

In this activity, the training system optimization strategy developed in the concept exploration phase must be revised to reflect new policy and training goals as well changes to existing training philosophies. The net result will be potential changes in the design prompts that are to be applied to training system components in A024, CREATE OPTIMUM BASELINE INTEGRATED TRAINING SYSTEM DESIGNS.

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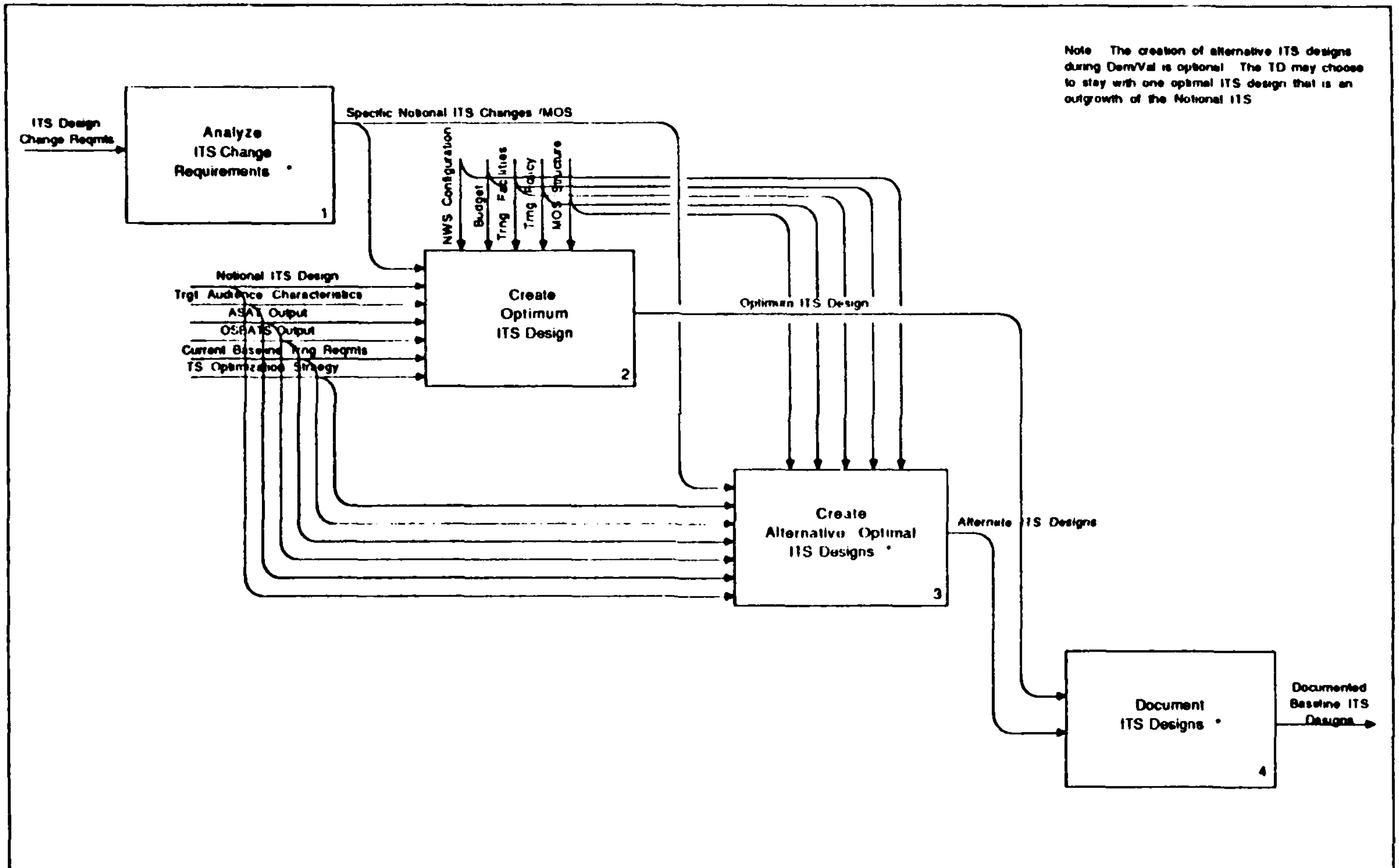

NODE:	TITLE:	NUMBER:
TRASER A024	Create Optimum Baseline Integrated Training System (ITS) Designs	

TRASER A024 CREATE OPTIMUM BASELINE INTEGRATED TRAINING SYSTEM DESIGNS

The possibility of creating at least two alternative optimum ITS designs will be provided. However, it is more likely that the training developer will simply modify the existing notional ITS rather than create new ITS designs. Either way, both designs will be based on current, baseline, training requirements rather than the notional training requirements developed largely from historical databases.

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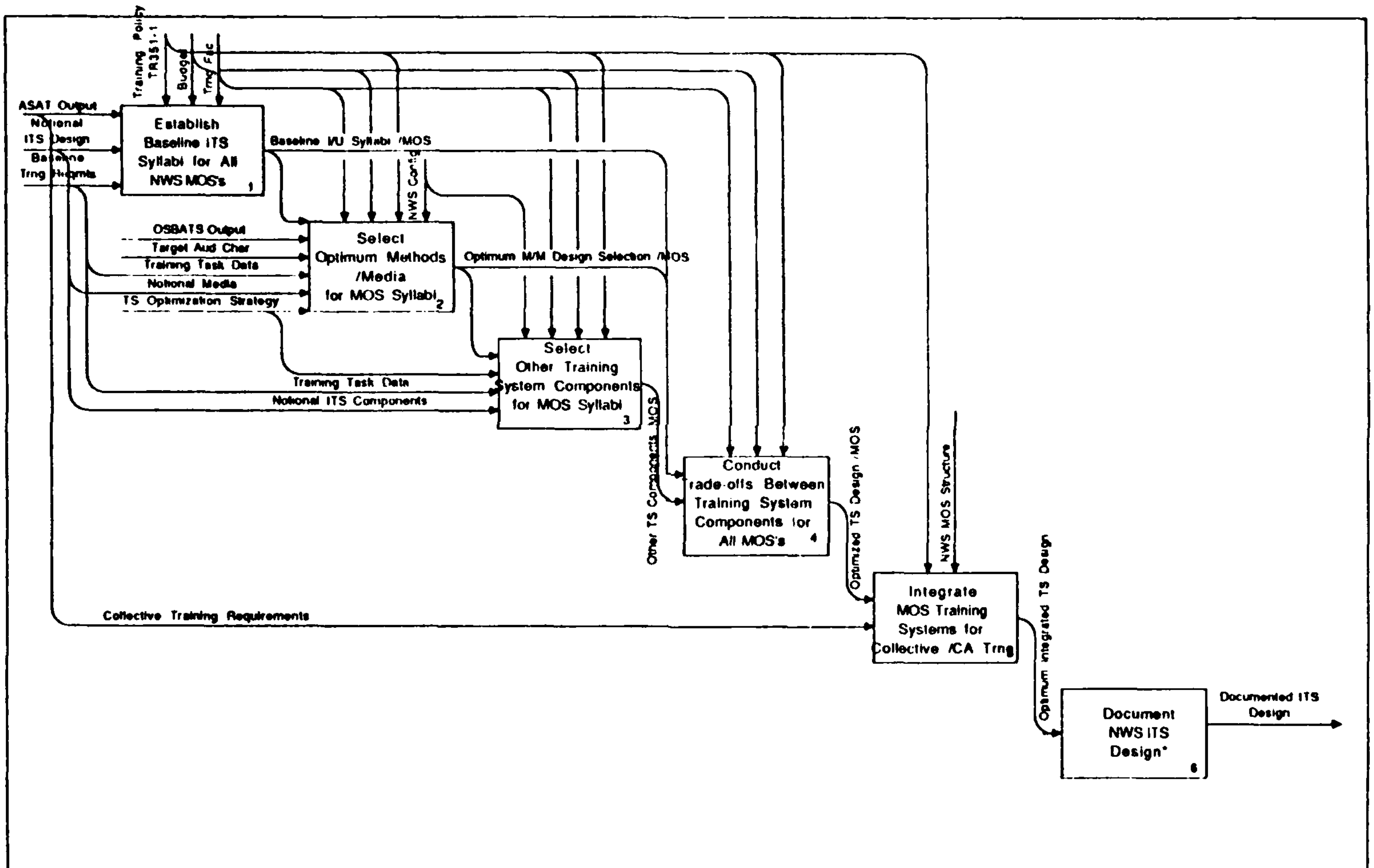

NODE: TRASER A0242	TITLE: Create Optimum ITS Design	NUMBER:

TRASER A0242 CREATE OPTIMUM ITS DESIGN

This activity is similar to the previous notional ITS design process with several major exceptions. Where the notional ITS design largely adopted historical training system designs, the baseline system will use the SAT process to establish MOS syllabi, select optimum methods and media, select consummables, identify required facilities, and generally identify other training system components. Further, both ASAT and OSBATS will be used to enhance and refine ITS definition. Once major ITS components have been selected, a series of trade-off studies will conducted to attempt to further optimize the design by varying the number of each type of component selected. For example, more simulators could be used to reduce the number of training aircraft procured which, in turn, would reduce the consummables (gas, ammunition) required in the ITS.

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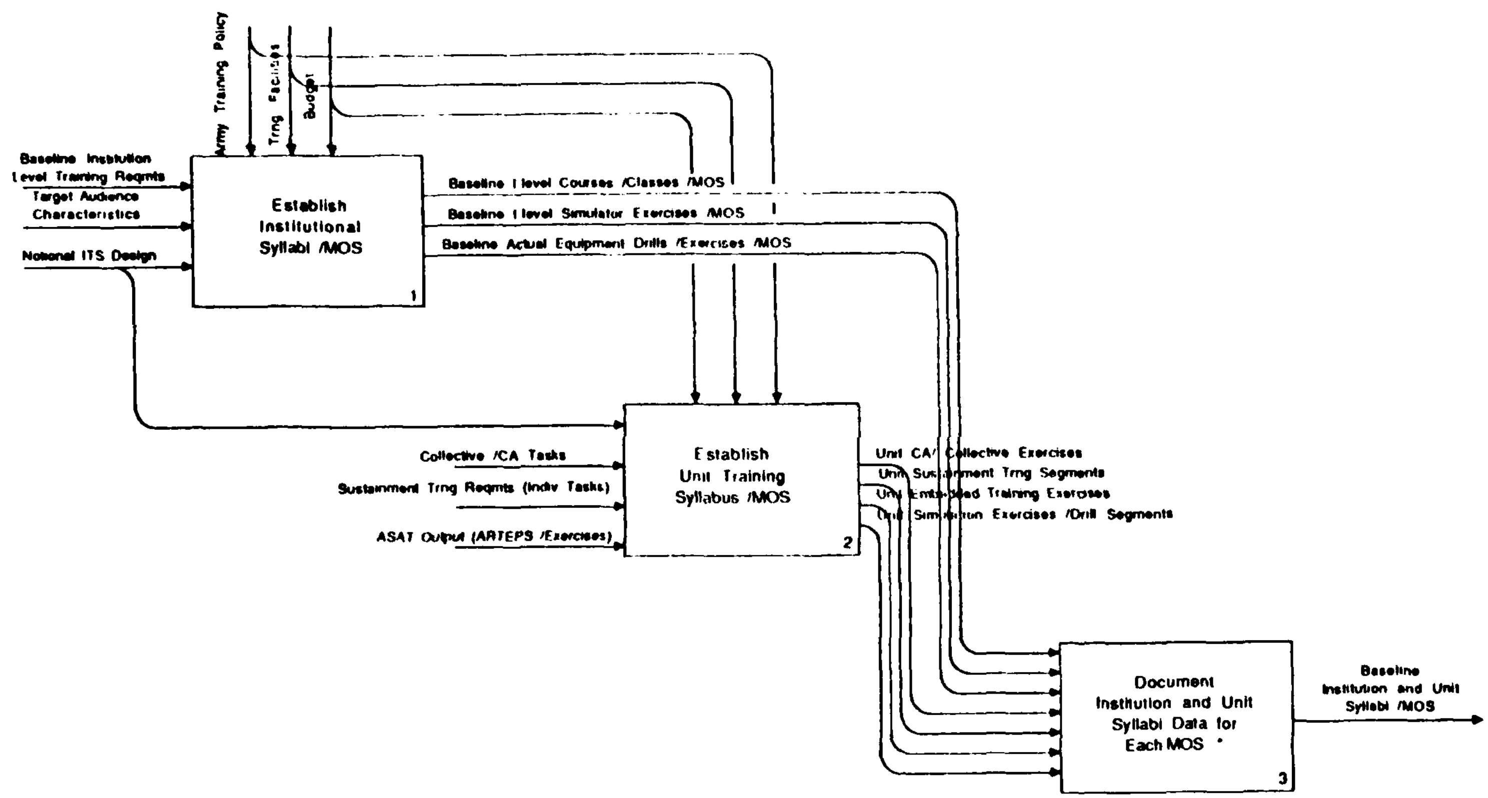

NODE:	TITLE:	NUMBER:
TRASER A02421 •	Establish Baseline ITS Syllabi for All NWS MOS's	

TRASER A02421 ESTABLISH BASELINE ITS SYLLABI FOR ALL NWS MOSs

Courses and exercises which compose the ITS syllabus for the MOS will be established, using SAT methodology. This process will include identification of courses and exercises for institution training as well as for unit training. Unit courses are composed of sustainment training segments, which generally will be self-teaching. ASAT will be used to identify unit missions.

USED AT:	AUTHOR: Feuge	DATE: 1/15/90	WORKING	READER	DATE	CONTEXT:
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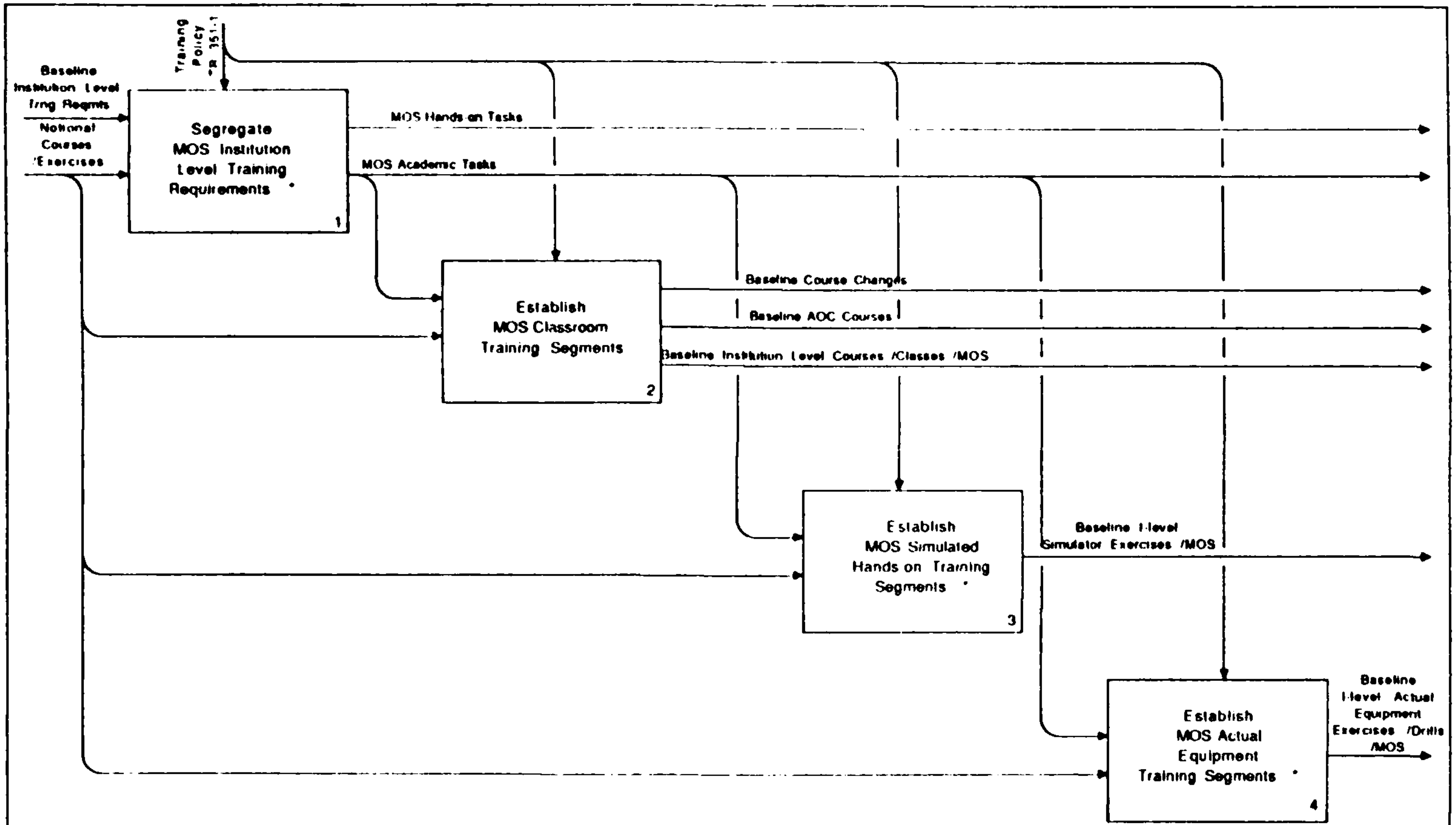
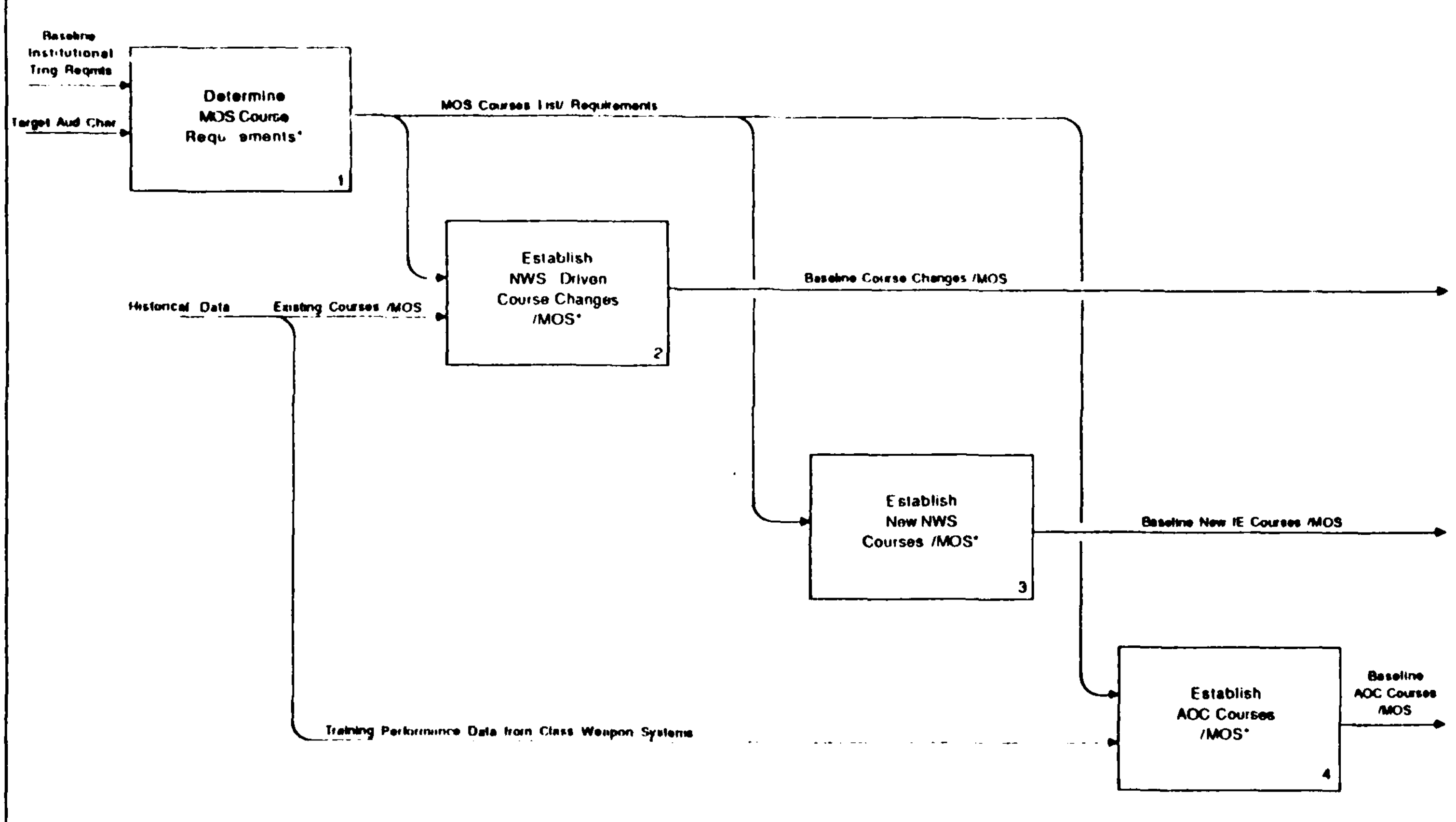


NODE:	TITLE:	NUMBER:
TRASER A024211 *	Establish Institution Syllabi /MOS	

TRASER A024211 ESTABLISH INSTITUTION SYLLABUS FOR EACH MOS

In this activity, institution-level training requirements, task data, will be segregated and used to establish classroom segments, hands-on segments, and actual equipment segments in the syllabi. Part of the task segregation process will involve identification of tasks that are knowledge oriented, hands-on dependent, and those that require the actual equipment to perform to standards.

USED AT: San Diego	AUTHOR: Feuge DATE: 1/15/90 PROJECT: TRASER REV: 1 NOTES 1 2 3 4 5 6 7 8 9 10	WORKING DRAFT RECOMMENDED PUBLICATION	READER DATE	CONTEXT: A024211



NODE: TRASER A0242112	TITLE: Establish MOS Classroom Training Segments	NUMBER:

TRASER A0242112 ESTABLISH MOS CLASSROOM TRAINING SEGMENTS

The various institution-level classroom segments for each MOS are identified. These segments cover requirements for AOC courses, new courses for IERW students, ASI course changes for maintenance and support personnel, and other required course segments. As part of these course segments, exercises and drills will also be identified. This function is applicable to all types of weapon systems, not just aviation.

USED AT:	AUTHOR: Feuge	DATE: 11/1/89		WORKING	READER	DATE	CONTEXT:
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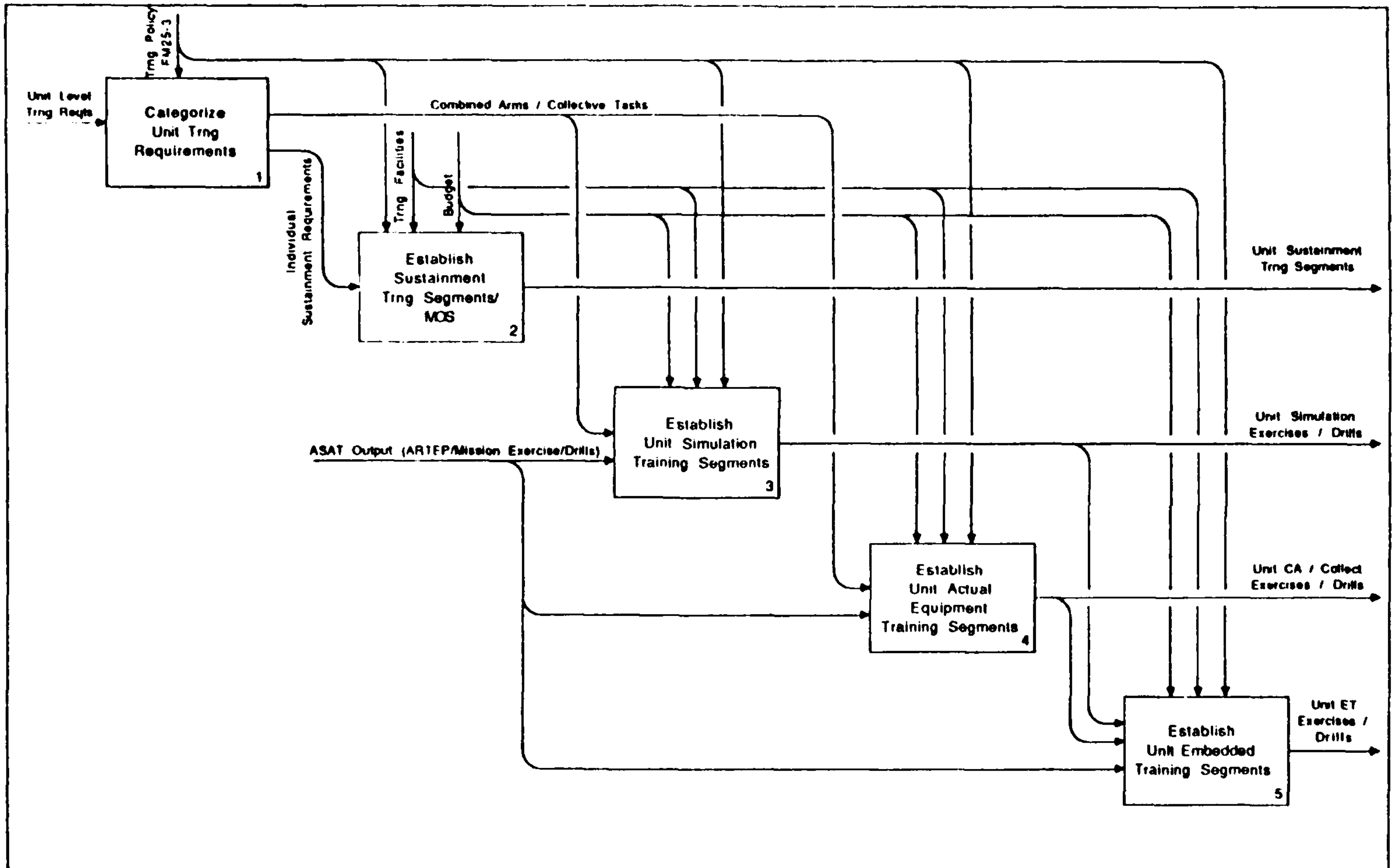

NODE:	TITLE:	NUMBER:
TRASER A024212	Establish Unit Syllabi for All NWS MOS's	

TRASER A024212 ESTABLISH UNIT SYLLABI FOR ALL NWS MOSs

In this activity, unit "syllabi" for all NWS MOSs will be established It should be noted that the term "syllabus" is used here to refer to all sustainment training segments, simulation segments, embedded training segments, drills, and exercises with actual equipment conducted at the unit to meet ARTEP requirements. A major input to this process will the output of ASAT which is assumed to include Mission Exercises, drills, and the ARTEP itself.

USED AT:	AUTHOR: Evans	DATE: 1/12/90	WORKING	READER	DATE	CONTEXT:
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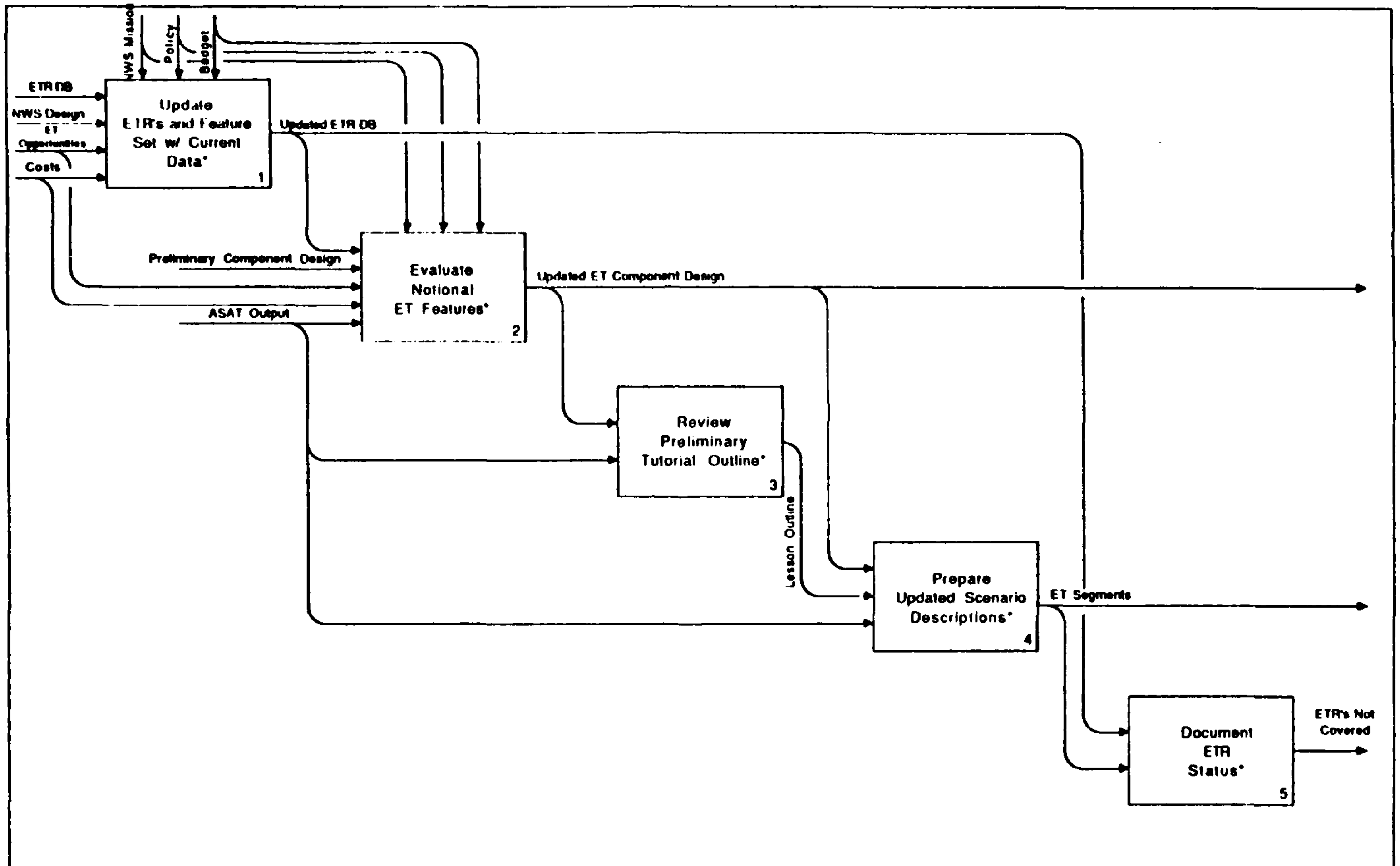

NODE:	TITLE:	NUMBER:
TRASER A0242125	Establish Unit Embedded Training Segments	

TRASER A0242125 ESTABLISH UNIT EMBEDDED TRAINING SEGMENTS

This activity takes advantage of any new, additional data regarding the NWS design, its mission or deployment strategy and revisits processes conduced in the earlier concept exploration phase. The purpose is to develop an updated set of embedded training requirements, opportunities and costs to feed into the ET feature selection process, and ultimately to use in developing preliminary lesson and scenario descriptions. A dearth of detailed information in earlier phases may have precluded certain processes from being executed. The previous analyses should be reviewed, both to identify gaps, and to reflect changes in the NWS design. The outcome should be an updated embedded training requirements data base and ET component design to feed into later detailed ET design steps. In addition, the ET database should be scanned to identify those requirements which are not covered in any of the tutorial or scenario descriptions developed to date but which were assigned a high training priority.

USED AT:	AUTHOR: Feuge	DATE: 1/15/90	WORKING	READER	DATE	CONTEXT:
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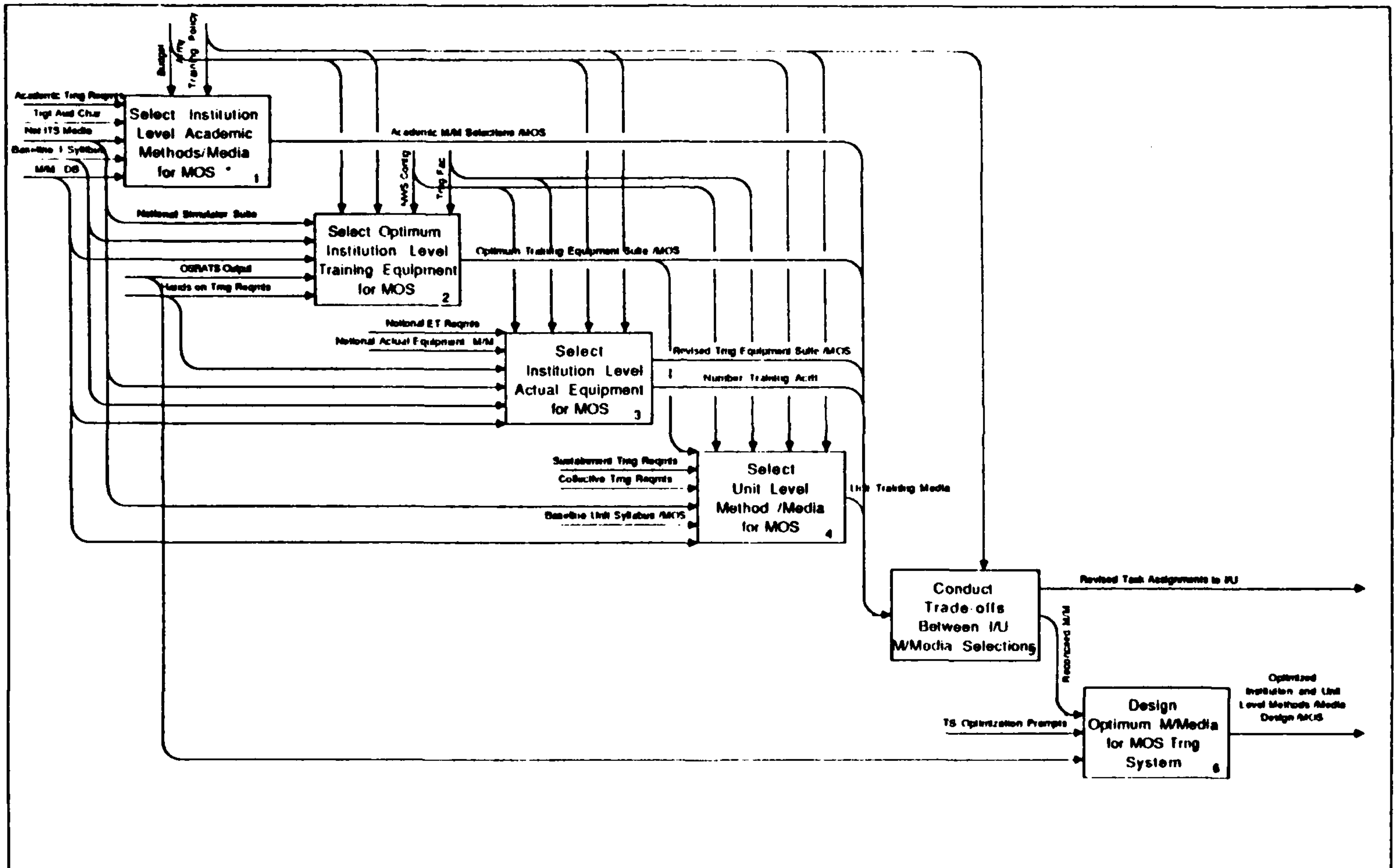

NODE: TRASER A02422	TITLE: Select and Design All Methods /Media for Each MOS Syllabus	NUMBER:

TRASER A02422 SELECT AND DESIGN ALL METHODS AND MEDIA FOR EACH MOS SYLLABUS

All instructional methods and media are selected for all MOS syllabi, using SAT methodology, and designed. Selections of methods and media are for both institution and unit levels of training for all operators, maintainers, and support personnel. Selections include academic media, training equipment, and actual equipment with embedded training. After trade-offs between classes of media whose purpose is to downshift media selections to lowest cost media, the selected media will be designed. Major inputs to the design process are OSBATS and the Training System Optimization Strategy. These two inputs will provide enough training system design detail to communicate the Army's desires to industry for FSD and Production training.

USED AT: San Diego	AUTHOR: Feuge PROJECT: TRASER NOTES: 1 2 3 4 5 6 7 8 9 10	DATE: 1/15/90 REV: 1		WORKING	READER	DATE	CONTEXT: A02422
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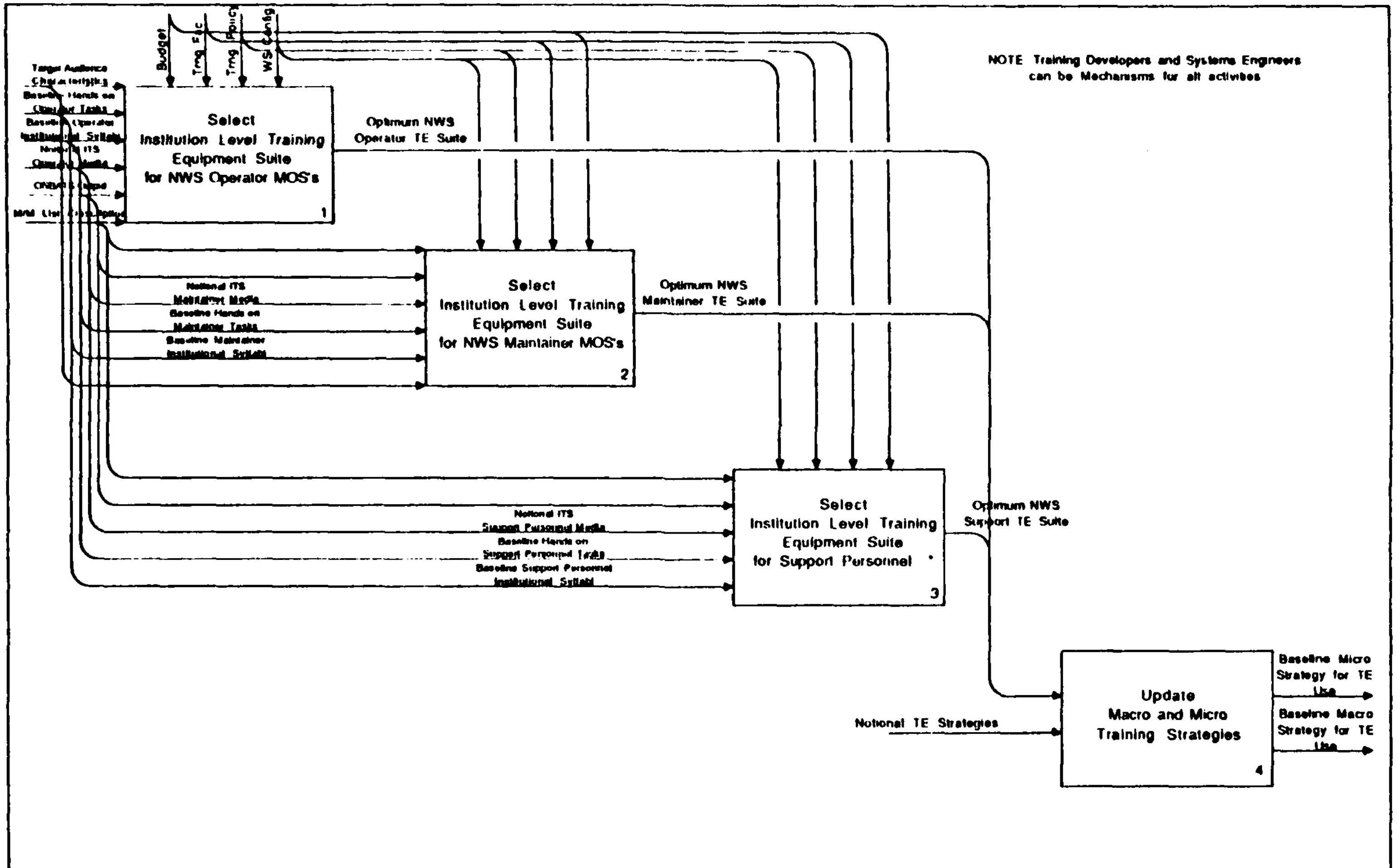

NODE: TRASER A024222	TITLE: Select Optimum Institutional Level Training Equipment for MOS's	NUMBER:

TRASER A024222 SELECT OPTIMUM INSTITUTIONAL LEVEL TRAINING EQUIPMENT FOR MOSs

In this activity, instructional level training equipment is selected for operators, maintainers, and support personnel.

USED AT:	AUTHOR: Feuge	DATE: 1/15/90		WORKING	READER	DATE	CONTEXT:
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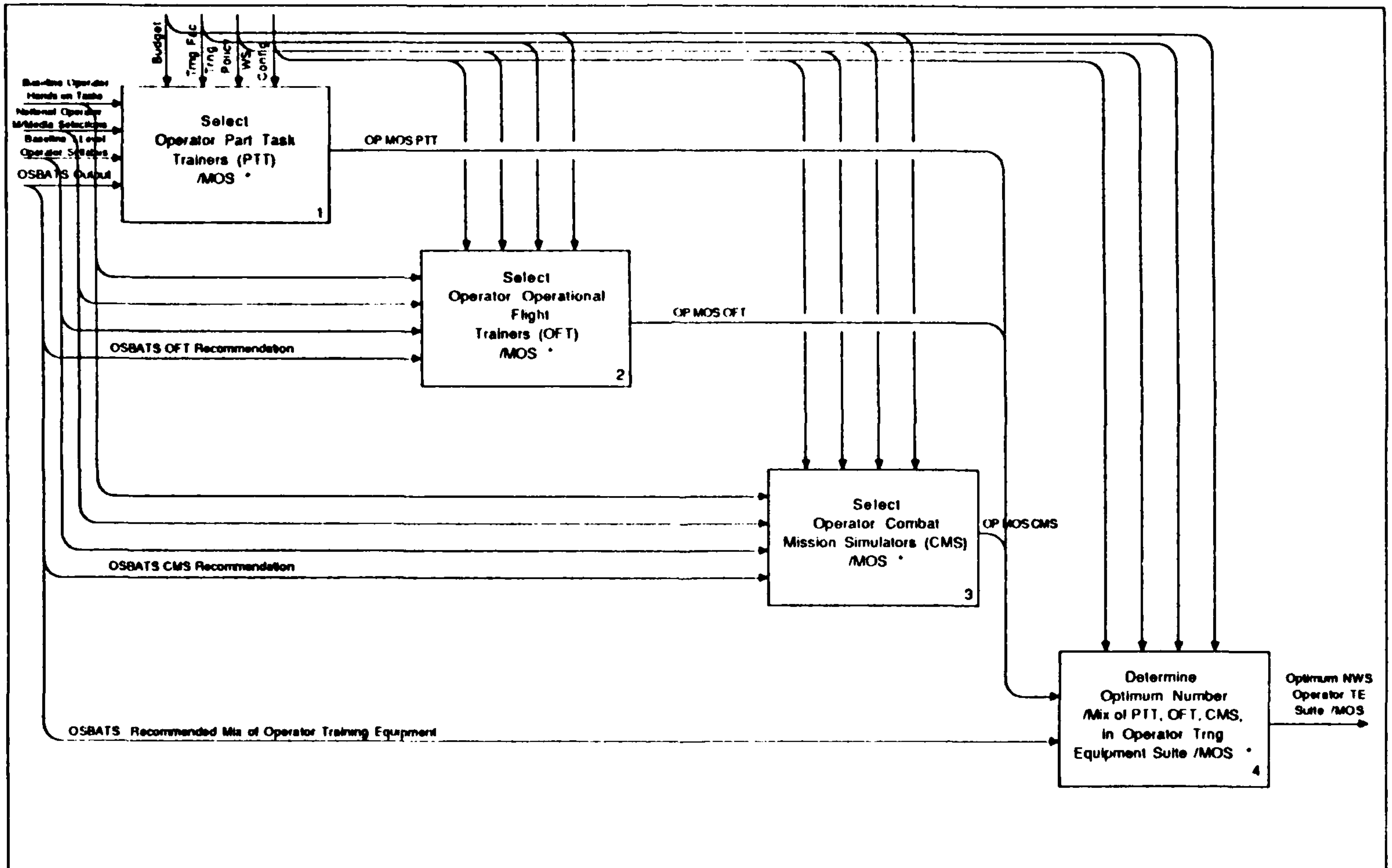

NODE:	TITLE:	NUMBER:
TRASER A0242221	Select Institution Level Training Equipment Suite for NWS Operator MOS's	

TRASER A0242221 SELECT INSTITUTIONAL LEVEL TRAINING EQUIPMENT FOR NWS OPERATOR MOSs

In this activity, specific types of training equipment can be selected for operator MOSs, including Part-task Trainers (PTT), Operational Flight Trainers (OFT), and Combat Mission Simulators (CMS). Other mikes of trainer types would be substituted for non-aviation weapon systems. In the final step, the optimum number of each category (mix) of training equipment is determined which are to compose the suite of operator training equipment for the MOS training system design.

USED AT:	AUTHOR: Feuge	DATE: 1/15/90		WORKING	READER	DATE	CONTEXT:
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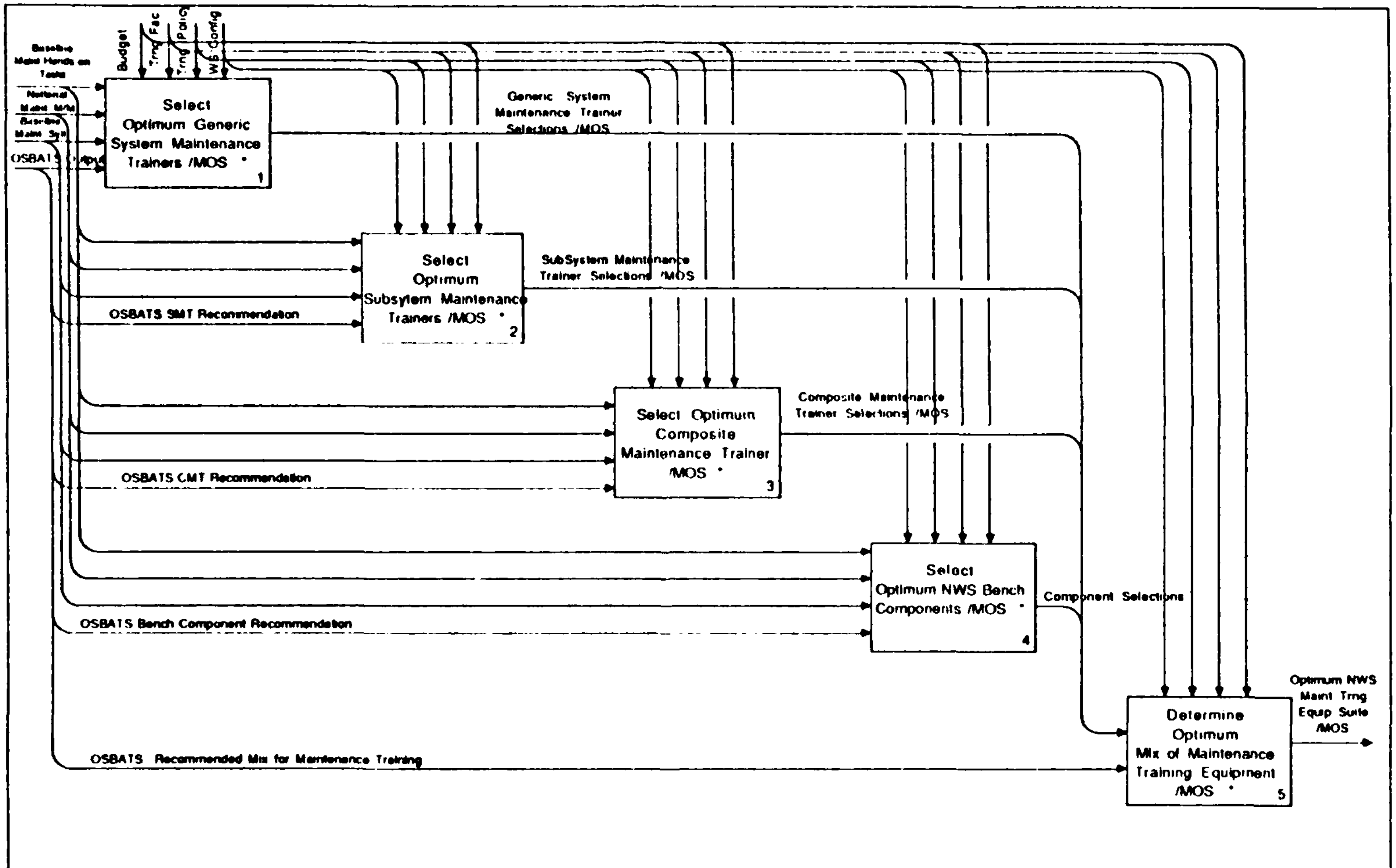

NODE:	TITLE:	NUMBER:
TRASER A0242222	Select Institution Level Training Equipment for NWS Maintainer MOS's	

TRASER A0242222 SELECT INSTITUTIONAL LEVEL TRAINING EQUIPMENT FOR NWS MAINTAINER MOSs

This activity is similar to A0242221 except that different categories of training equipment apply to maintainer training. In this step, a suite composed of generic system maintenance trainers (GSMT), subsystem maintenance trainers (SMT), composite maintenance trainers (CMT), and NWS bench components is selected. In the final step, the optimum number of each type is determined to complete the description of the suite.

USED AT:	AUTHOR: Feuge	DATE: 1/15/90		WORKING	READER	DATE	CONTEXT:
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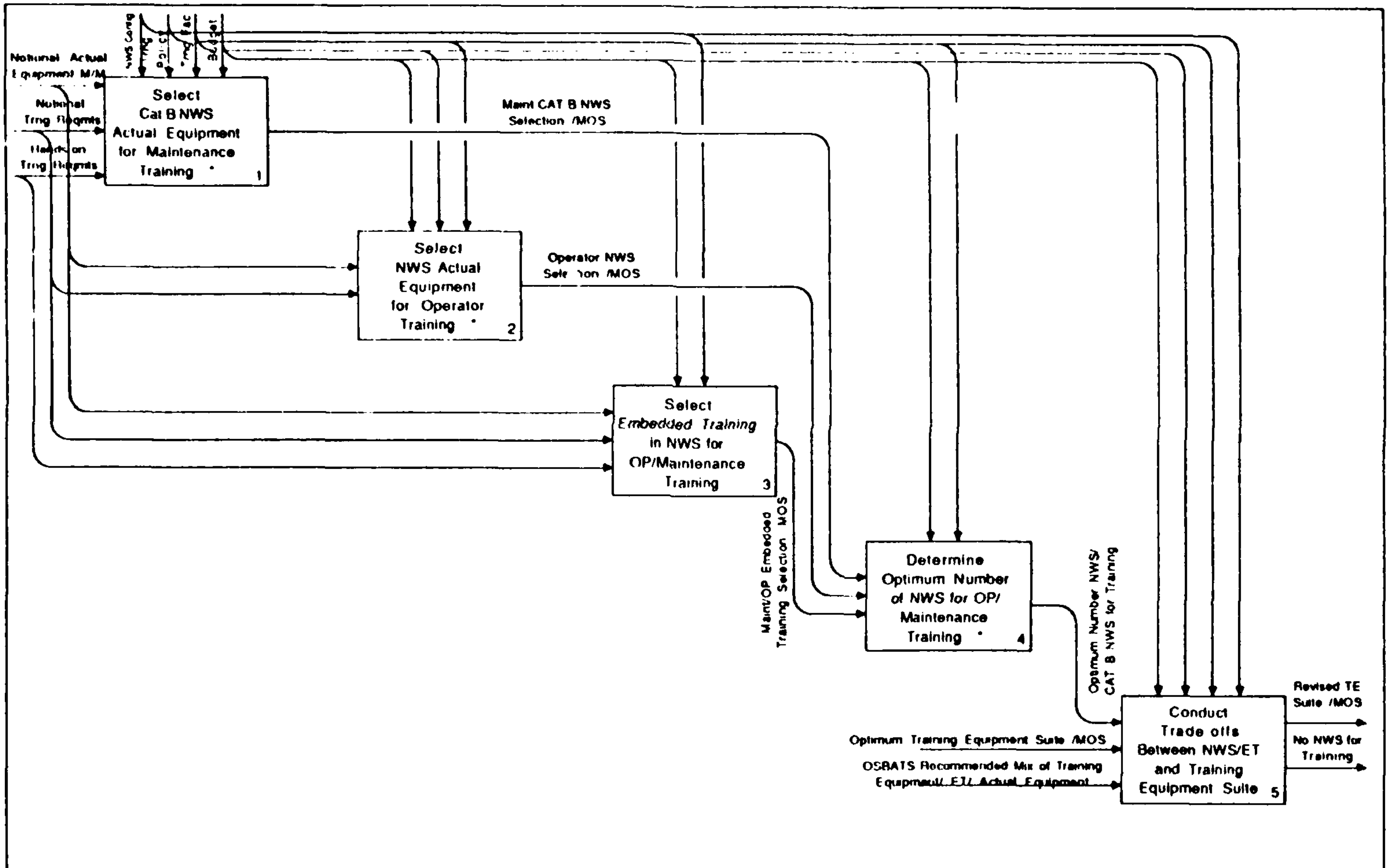
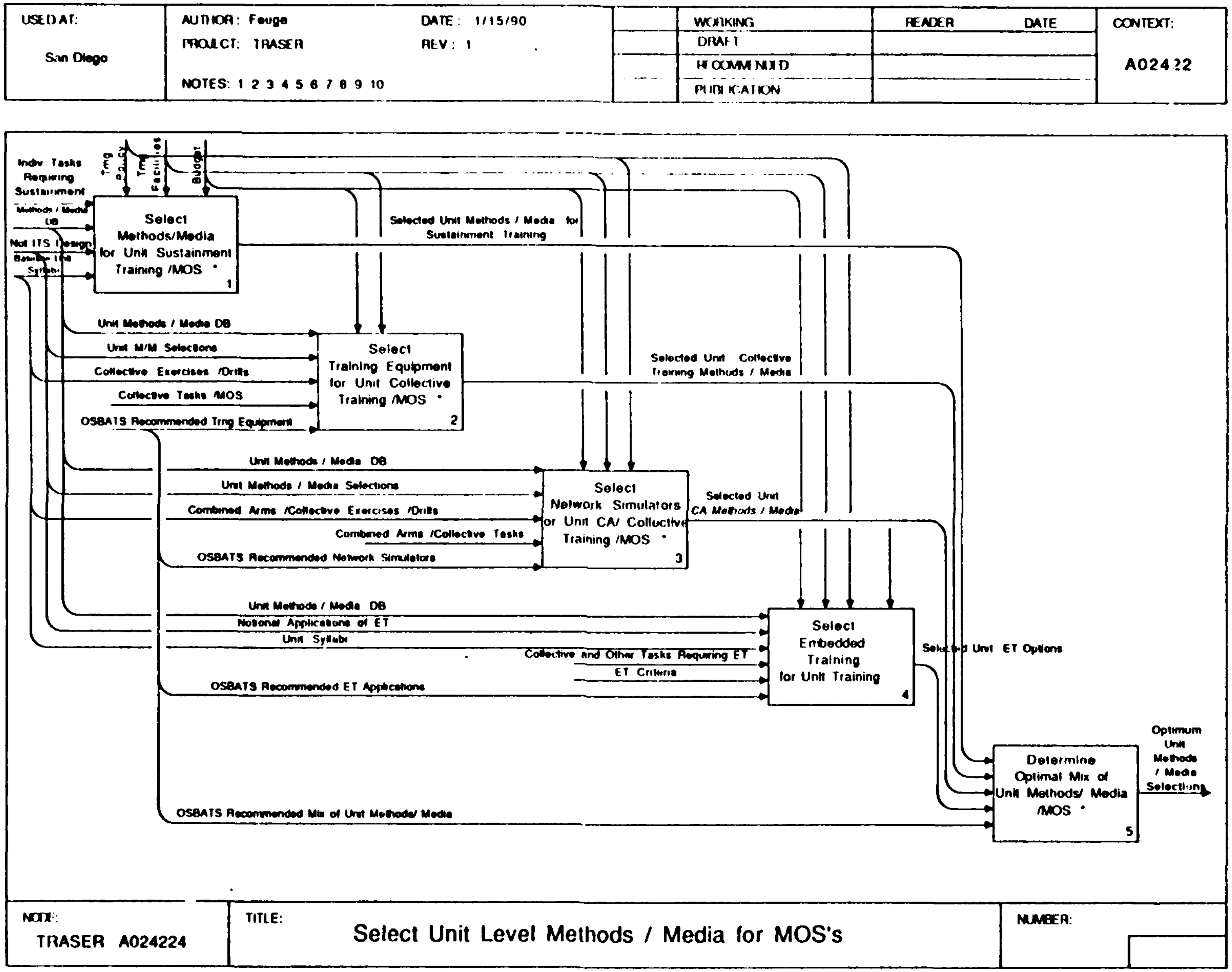


NODE:	TITLE:	NUMBER:
TRASER A024223	Select Institutional Actual Equipment (NWS) for MOS's	

TRASER A024223 SELECT INSTITUTIONAL LEVEL ACTUAL EQUIPMENT (NWS) FOR MOSs

In this activity, actual equipment to support all MOSs, operator and maintainer, are selected and optimized with respect to training equipment suites. As part of the process, embedded training is considered as an alternative to the actual equipment suite. A major input to this process is OSBATS recommendations for both embedded training and actual equipment.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AUTHOR: Feuge
PROJECT: TRASER
DATE: 1/15/90
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DATE
CONTEXT:
A02422
Indiv Tasks Requiring Sustainment
Methods / Media DB
Nat ITS Design
Baseline Unit Syllabi
Trng Policy
Trng Facilities
Budget
Select Methods/Media for Unit Sustainment Training /MOS * 1
Selected Unit Methods / Media for Sustainment Training
Unit Methods / Media DB
Unit M/M Selections
Collective Exercises /Drills
Collective Tasks /MOS
OSBATS Recommended Trng Equipment
Select Training Equipment for Unit Collective Training /MOS * 2
Selected Unit Collective Training Methods / Media
Unit Methods / Media DB
Unit Methods / Media Selections
Combined Arms /Collective Exercises /Drills
Combined Arms /Collective Tasks
OSBATS Recommended Network Simulators
Select Network Simulators for Unit CA/ Collective Training /MOS * 3
Selected Unit CA Methods / Media
Unit Methods / Media DB
Notional Applications of ET
Unit Syllabi
Collective and Other Tasks Requiring ET
ET Criteria
OSBATS Recommended ET Applications
Select Embedded Training for Unit Training 4
Selected Unit ET Options
OSBATS Recommended Mix of Unit Methods/ Media
Determine Optimal Mix of Unit Methods/ Media /MOS * 5
Optimum Unit Methods / Media Selections
NODE: TRASER A024224
TITLE: Select Unit Level Methods / Media for MOS's
NUMBER:

TRASER A024224 SELECT UNIT LEVEL METHODS AND MEDIA FOR MOSs

In this activity, method and media combinations for unit training are selected, including sustainment training, simulation training, network simulation training, and embedded training in actual NWS equipment. As part of the process, the optimum mix of unit methods and media are determined for each MOS.

USED AT:	AUTHOR: Evans	DATE: 1/12/90		WORKING	READER	DATE	CONTEXT:
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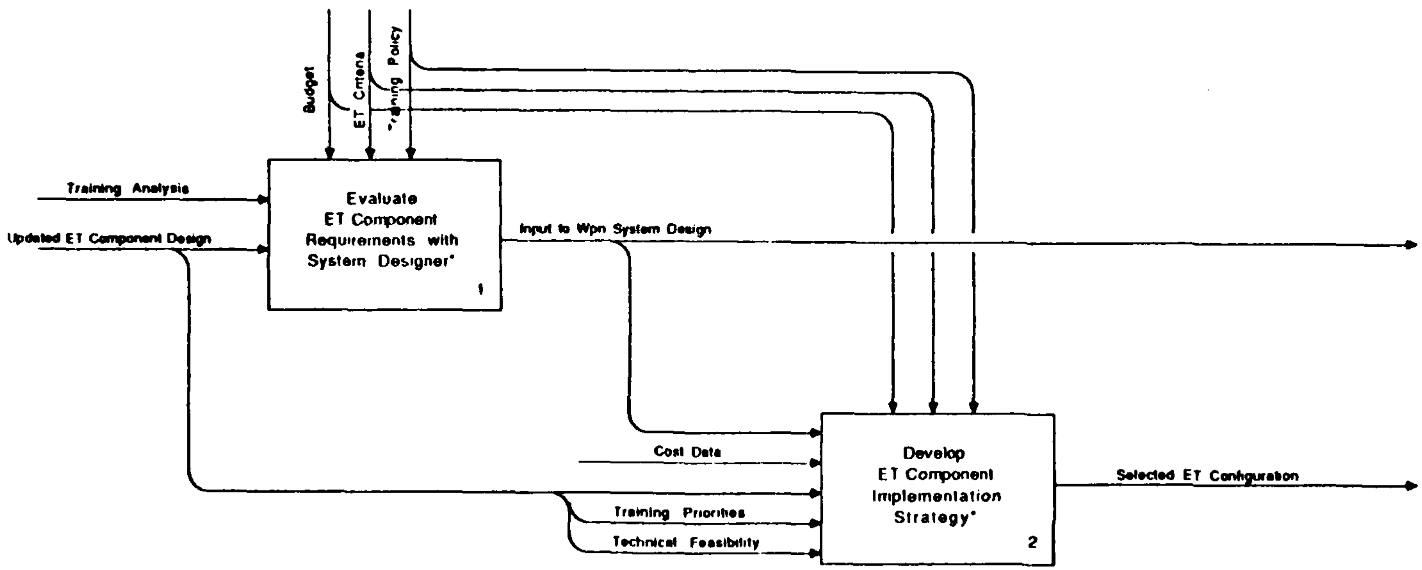

NODE:	TITLE:	NUMBER:
TRASER A0242244	Select Embedded Training for Unit Training	

TRASER A0242244 *SELECT EMBEDDED TRAINING FOR UNIT TRAINING*

The process of selecting ET for unit training, or for institutional training, at this level, involves a conscious effort to integrate ET design requirements into the prime system development process, and reflects an ongoing coordination between training designer and system engineer. Army representatives, as well as prime system engineers and training designers should participate. An ET component implementation strategy follows, which reflects a tradeoff between training priorities, technical feasibility, and cost to develop, operate or maintain. Training policy, ET criteria and budgetary constraints serve as controls throughout the block. The outcome is a selected ET configuration, which specifies the form and mode of embedded training proposed.

USED AT:	AUTHOR: Feuge	DATE: 1/15/90		WORKING	READER	DATE	CONTEXT:
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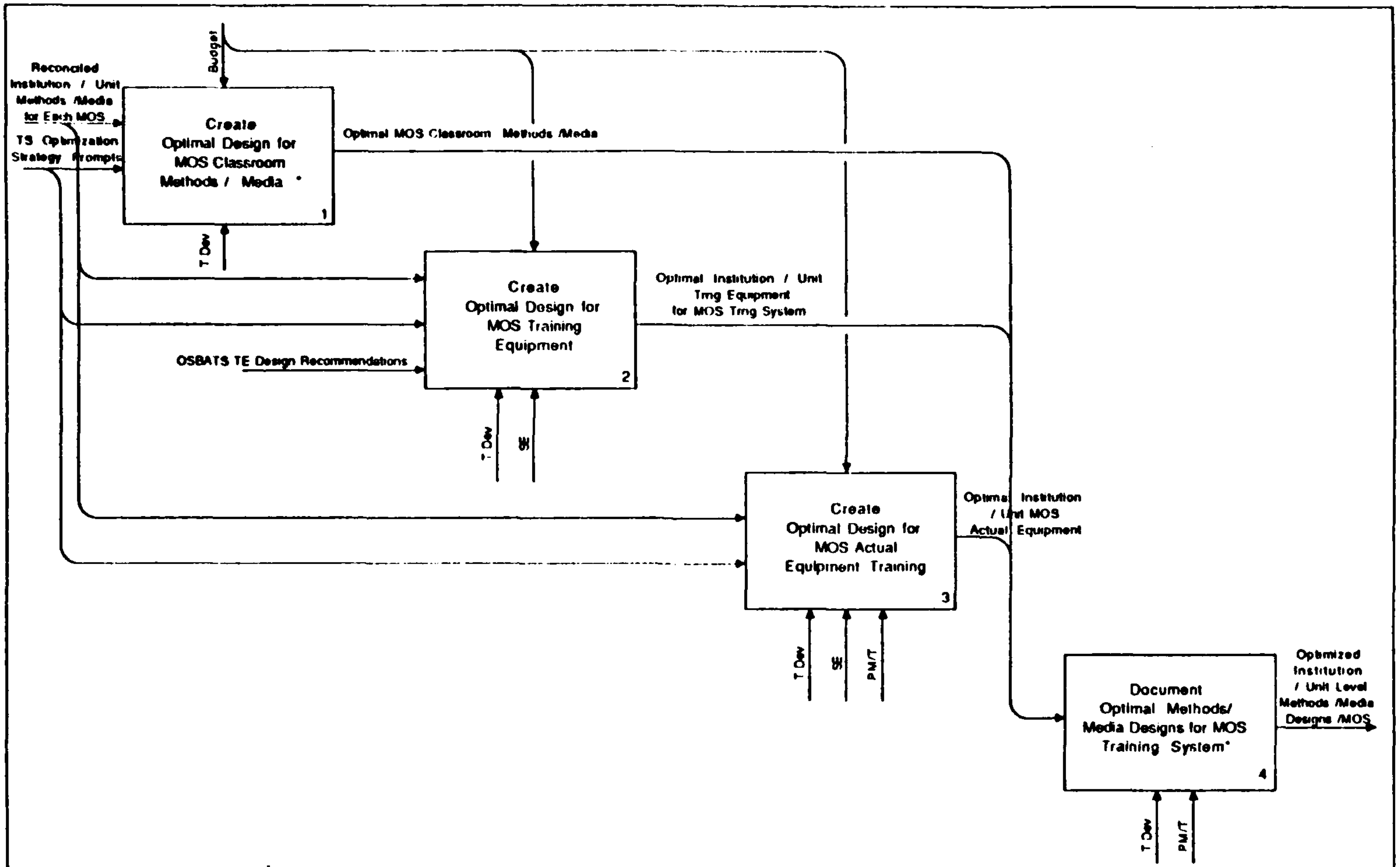

NODE:	TITLE:	NUMBER:
TRASER A024226	Design Optimal Methods /Media for MOS Training Systems	

TRASER A024226 DESIGN OPTIMUM METHODS AND MEDIA FOR MOS TRAINING SYSTEMS

In this activity, the selected classroom, training equipment, and actual equipment methods and media are designed. The verb "design", in this sense, pushes identified methods and media beyond the mere establishment of requirements to the point of specifying the form that the media will take.

USED AT:	AUTHOR: Feuge	DATE: 1/15/90		WORKING	READER	DATE	CONTEXT:
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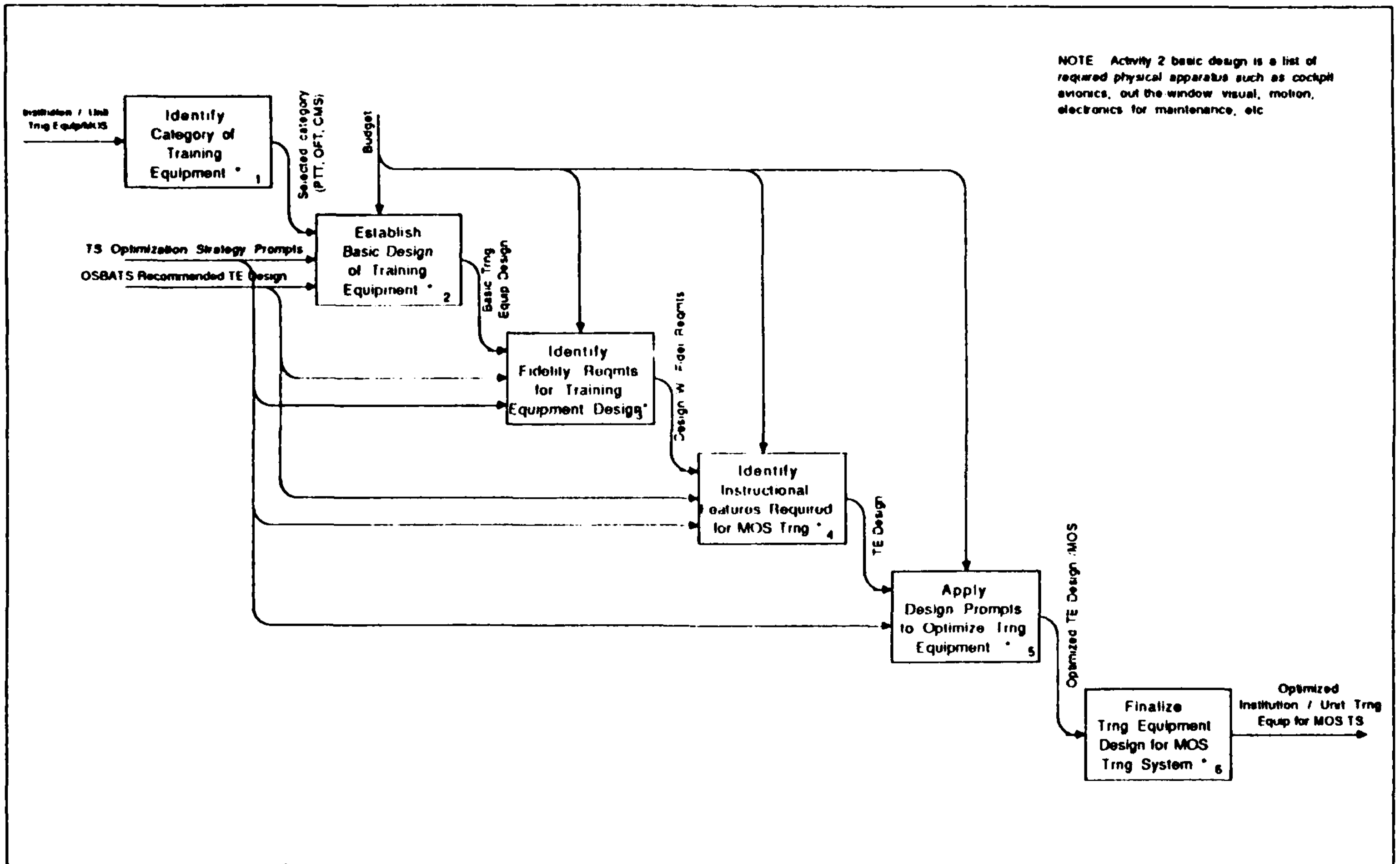

NODE:	TITLE:	NUMBER:
TRASER A0242262*	Create Optimum Design for MOS Training Equipment	

TRASER A0242262 CREATE OPTIMUM DESIGN FOR MOS TRAINING EQUIPMENT

In this activity, each category of training equipment is designed for use in a specific MOS training system. For example, selection of a CMS for Pilot Training in this step is evolved to the point of designating visual system capability, motion, fidelity, instructional features, and other design details. These design features will be necessary to produce procurement documents (at the end of the Dememonstration and Validation Phase) that communicate the Army's desires. Major contributions to the design process are provided by the design prompts that stem directly from the training design approach philosophy in the optimization strategy. Other useful input for the design process will come from OSBATS.

USED AT:	AUTHOR: Feuge	DATE: 1/15/90		WORKING	READER	DATE	CONTEXT:
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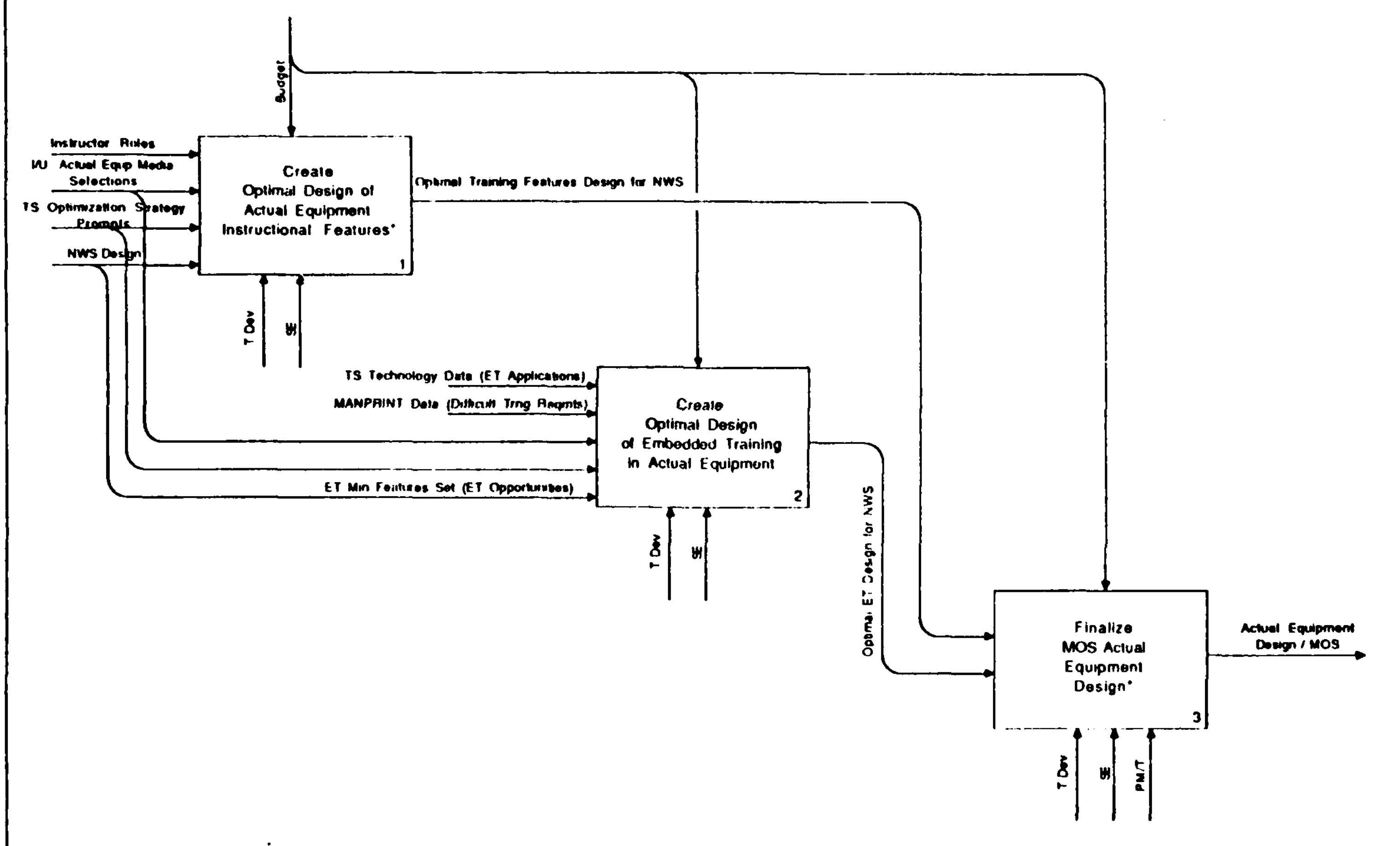
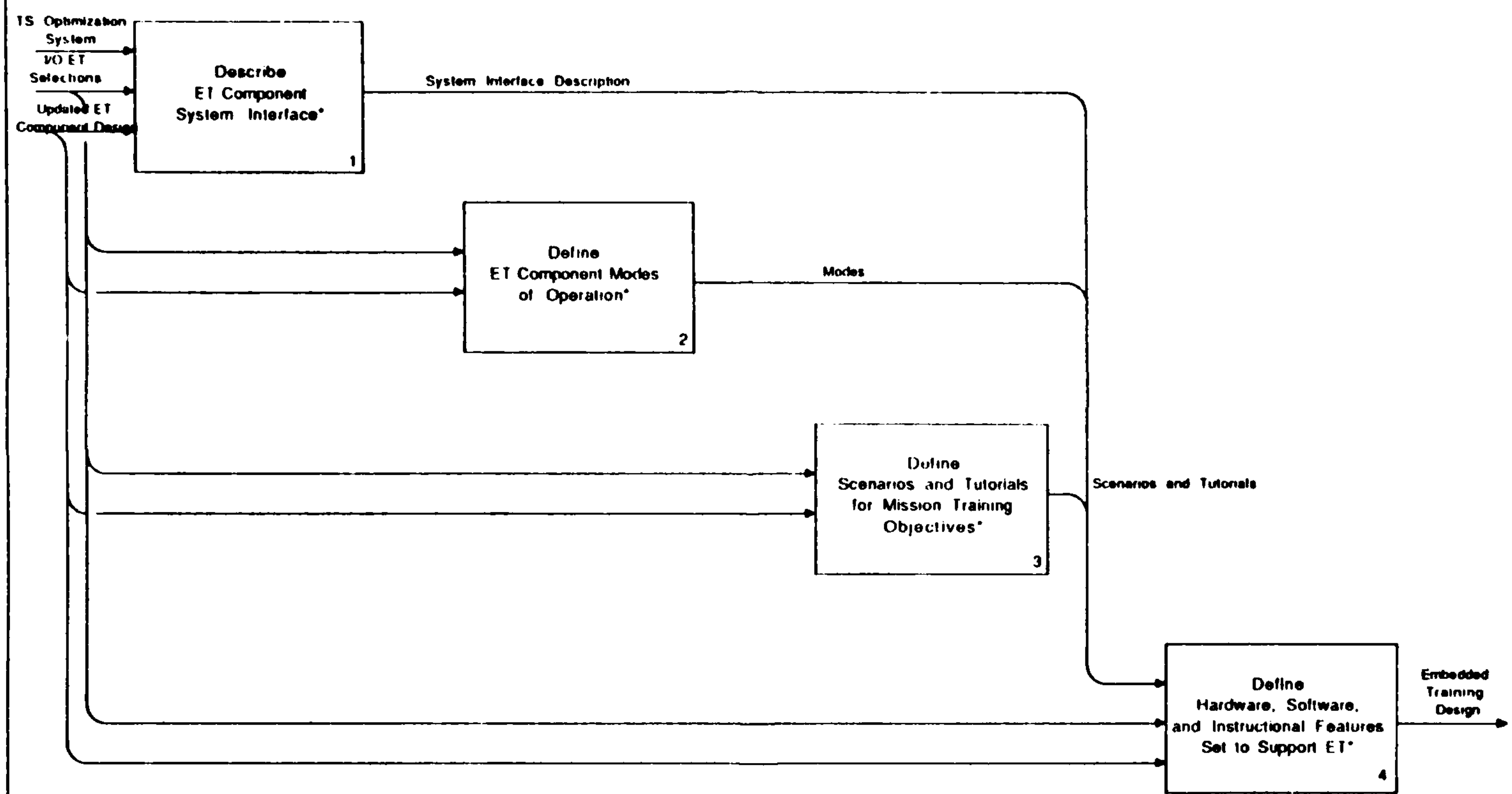


NODE:	TITLE:	NUMBER:
TRASER A0242263	Create Optimal Design for MOS Actual Equipment Training	

TRASER A0242263 CREATE OPTIMUM DESIGN FOR MOS ACTUAL EQUIPMENT TRAINING

In this step, the optimal design for actual equipment used for aircrew or maintenance training is created. This process selects and designs instructional features for the aircraft as well as designs the embedded training features that will go on the aircraft. In the case of maintenance, training aircraft could be used rather than prime aircraft.

USED AT: Arlington	AUTHOR: Evans DATE 1/12/90 PROJECT: TRASER REV: 1 NOTES: 1 2 3 4 5 6 7 8 9 10		WORKING DRAFT RECOMMENDED PUBLICATION	READER	DATE	CONTEXT: A0242263



NODE: TRASER A02422632	TITLE: Create Optimal Design of Embedded Training	NUMBER:

TRASER A02422632 CREATE OPTIMAL DESIGN OF EMBEDDED TRAINING

This activity compiles ET information produced throughout the TRASER process to produce a functional specification for ET. The final product of the design effort should be a workable specification of the ET component functions, in a form consistent with the materiel developers requirements. The specification includes hardware and software requirements, as well as full descriptions of the required training functions and features. Any scenario descriptions and tutorial outlines generated thus far should be included. The description should also clearly state the type of training to be provided, the training population's characteristics, the ET component system interface, the ET modes of operation, restrictions on transition time for strap-on ET, the missions to be trained, the training setting and environment, stimulation and simulation characteristics, hardware characteristics, including the NWS, and software characteristics.

USED AT:	AUTHOR: Feuge	DATE: 1/15/90	WORKING	READER	DATE	CONTEXT:
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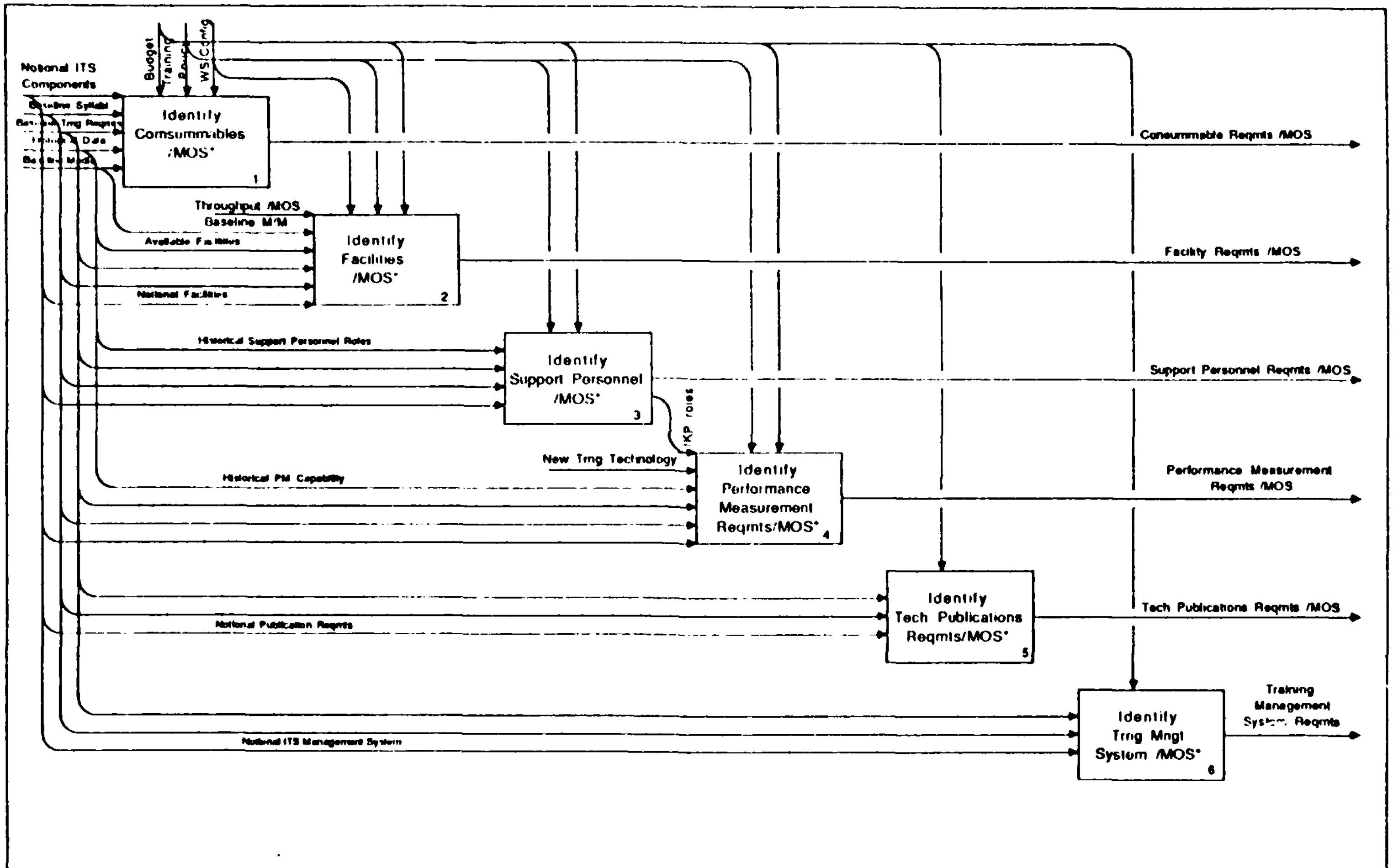

NODE:	TITLE:	NUMBER:
TRASER A02423	Select Other Training System Components /MOS Syllabi	

TRASER A02423 SELECT OTHER TRAINING SYSTEM COMPONENTS FOR MOS SYLLABI

In this segment of TRASER, other critical components of the training system will be selected to round out the complete training system. As in the notional ITS process, this step involves selecting consummables, facilities, support personnel, performance measurement systems, technical publications, and training management systems. At this stage, the training developer should identify optimal components without overemphasis on budget limits. Later, trade-offs will be conducted to refine the ITS design and make the ITS cost-effective.

USED AT:	AUTHOR: Feuge	DATE: 1/15/90		WORKING	READER	DATE	CONTEXT:
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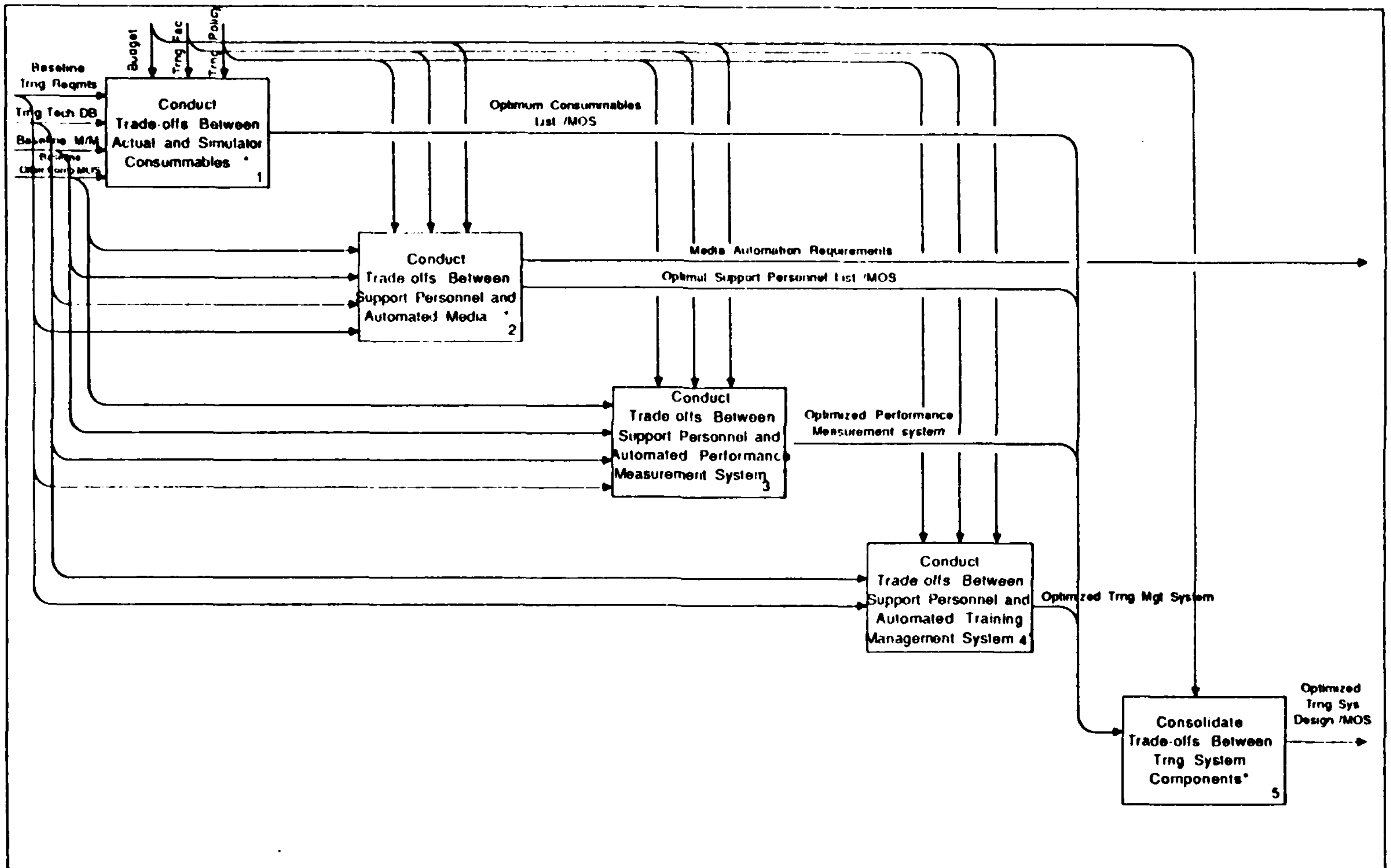
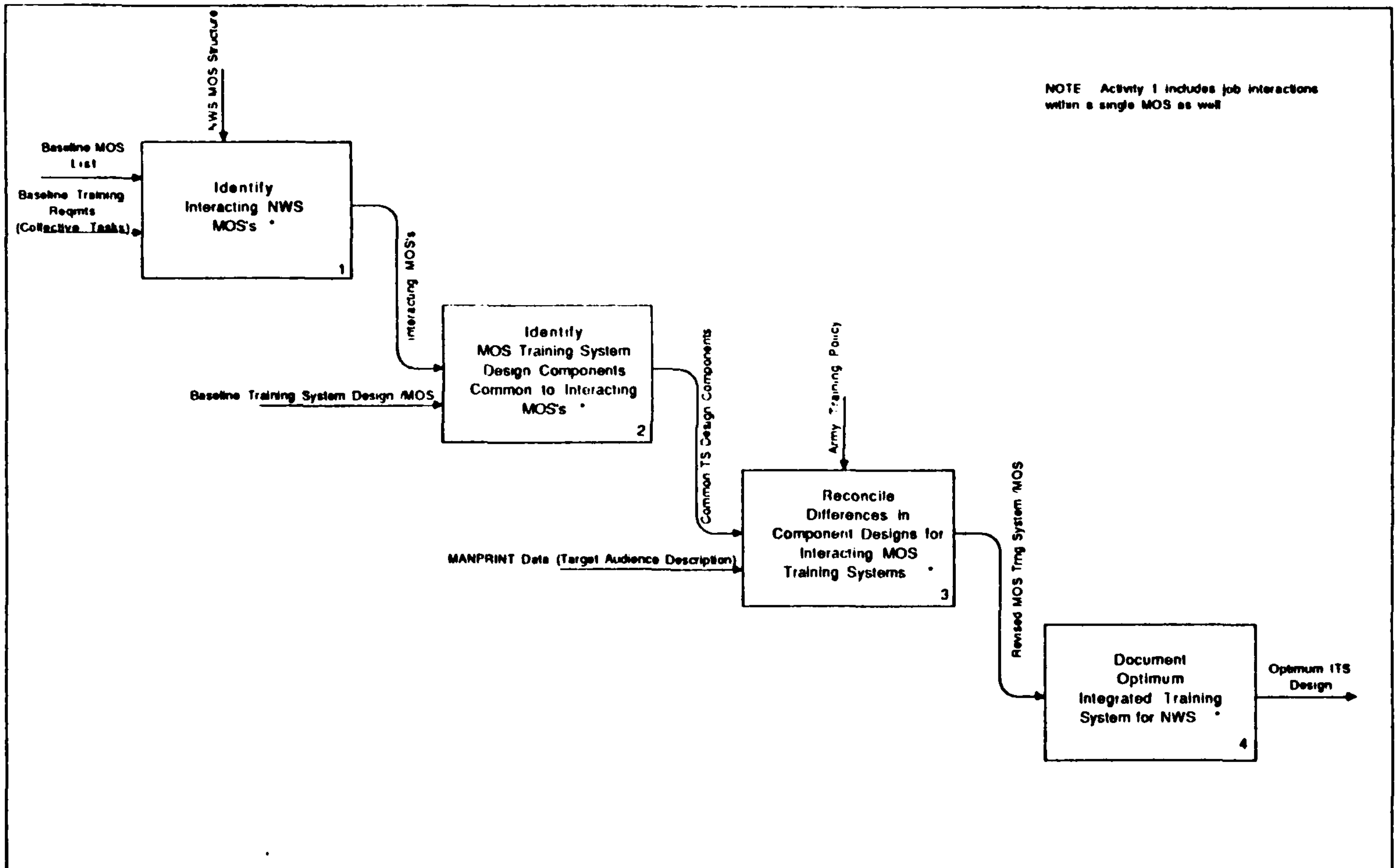


NODE:	TITLE:	NUMBER:
TRASER A02424 *	Conduct Trade-offs Between Training System Components for MOS's	

TRASER A02424 CONDUCT TRADE-OFFS BETWEEN TRAINING SYSTEM COMPONENTS FOR MOSs

In this activity, a series of specific trade-off studies are proposed to further optimize the design for each MOS training system. Specific trade-offs suggested are between actual equipment and simulator consummables; between support personnel such as instructors and automated media; between support personnel and automated performance measurement; between support personnel and automated training management functions; and others. This set of trade-offs is unique to TRASER but representative of some trade-offs made by training developers in arriving at NWS training system designs.

USED AT: San Diego	AUTHOR: Feuge PROJECT: TRASER NOTES: 1 2 3 4 5 6 7 8 9 10	DATE: 1/15/90 REV: 1		WORKING / DRAFT / RECOMMENDED / PUBLICATION	READER	DATE	CONTEXT: A0242



NODE: TRASER A02425

TITLE: Integrate MOS Training System Designs for Combined Arms and Collective Training

NUMBER:

TRASER A02425 INTEGRATE MOS TRAINING SYSTEM DESIGNS FOR COMBINED ARMS AND COLLECTIVE TRAINING

In this activity, interacting MOSs (such a Pilot and Gunner on an Attack Helicopter) are identified and the training system designs for those interacting MOSs are modified to take advantage of opportunities to train together at both the instructional and unit levels as well as reducing training costs by reducing redundancies.

USED AT:	AUTHOR: Feuge	DATE: 1/15/90		WORKING	READER	DATE	CONTEXT:
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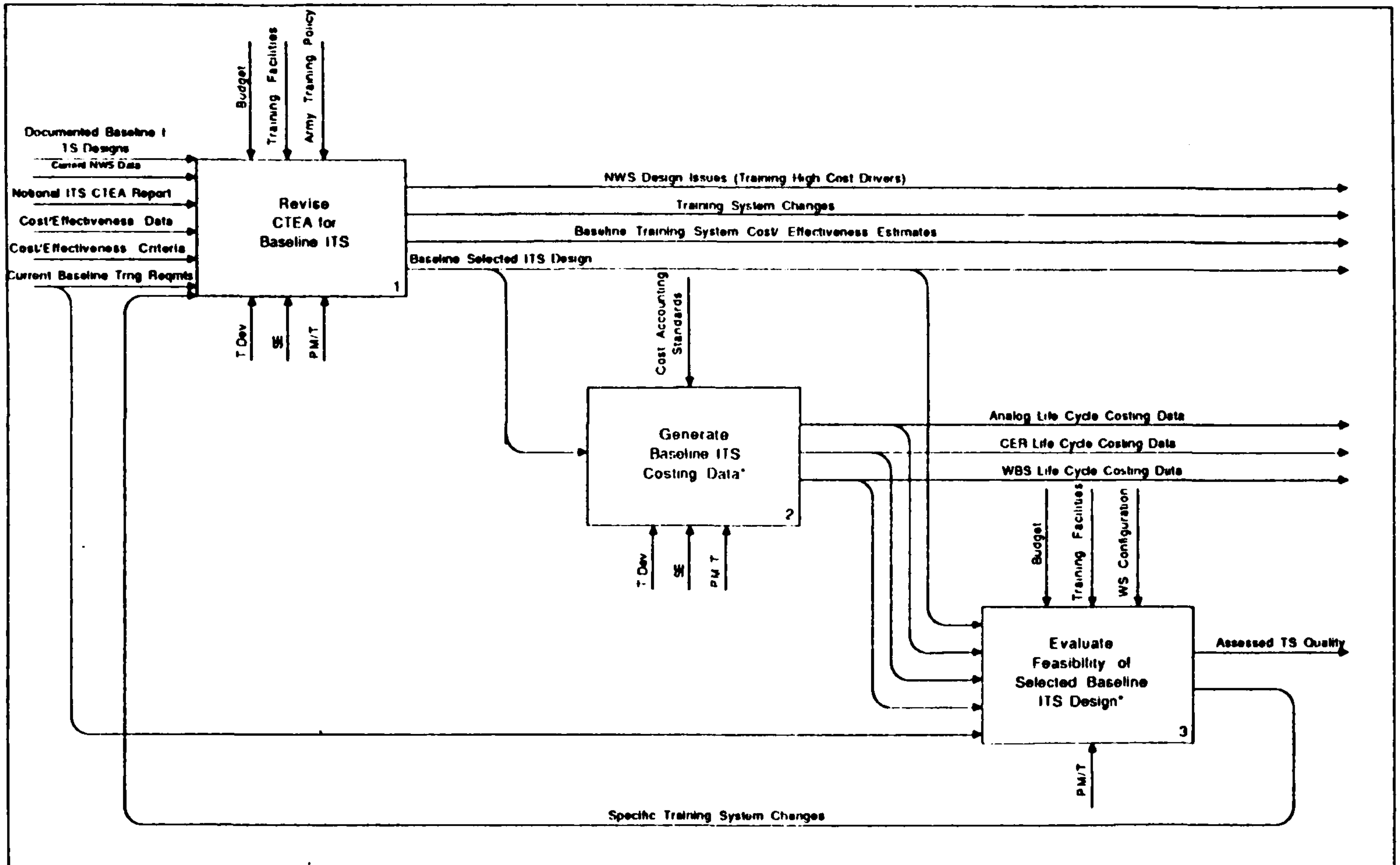

NODE:	TITLE:	NUMBER:
TRASER A025	Evaluate Baseline Integrated Training System Designs	

TRASER A025 EVALUATE BASELINE INTEGRATED TRAINING SYSTEM DESIGN

In this activity, the CTEA is revised to reflect changes between the Notional ITS and the Baseline ITS. In addition, baseline cost data is generated to support Program Cost Analysts. The final step is to evaluate the feasibility of the Baseline ITS design in terms of what is currently know about the training sites, the NWS, and baseline training requirements. Areas of infeasible design will be fed back to the CTEA process redesigned, and costed before output to the next step. If the training developer is content with the ITS design, this step of the process can be omitted.

USED AT:	AUTHOR: Feuge	DATE: 1/15/90		WORKING	READER	DATE	CONTEXT:
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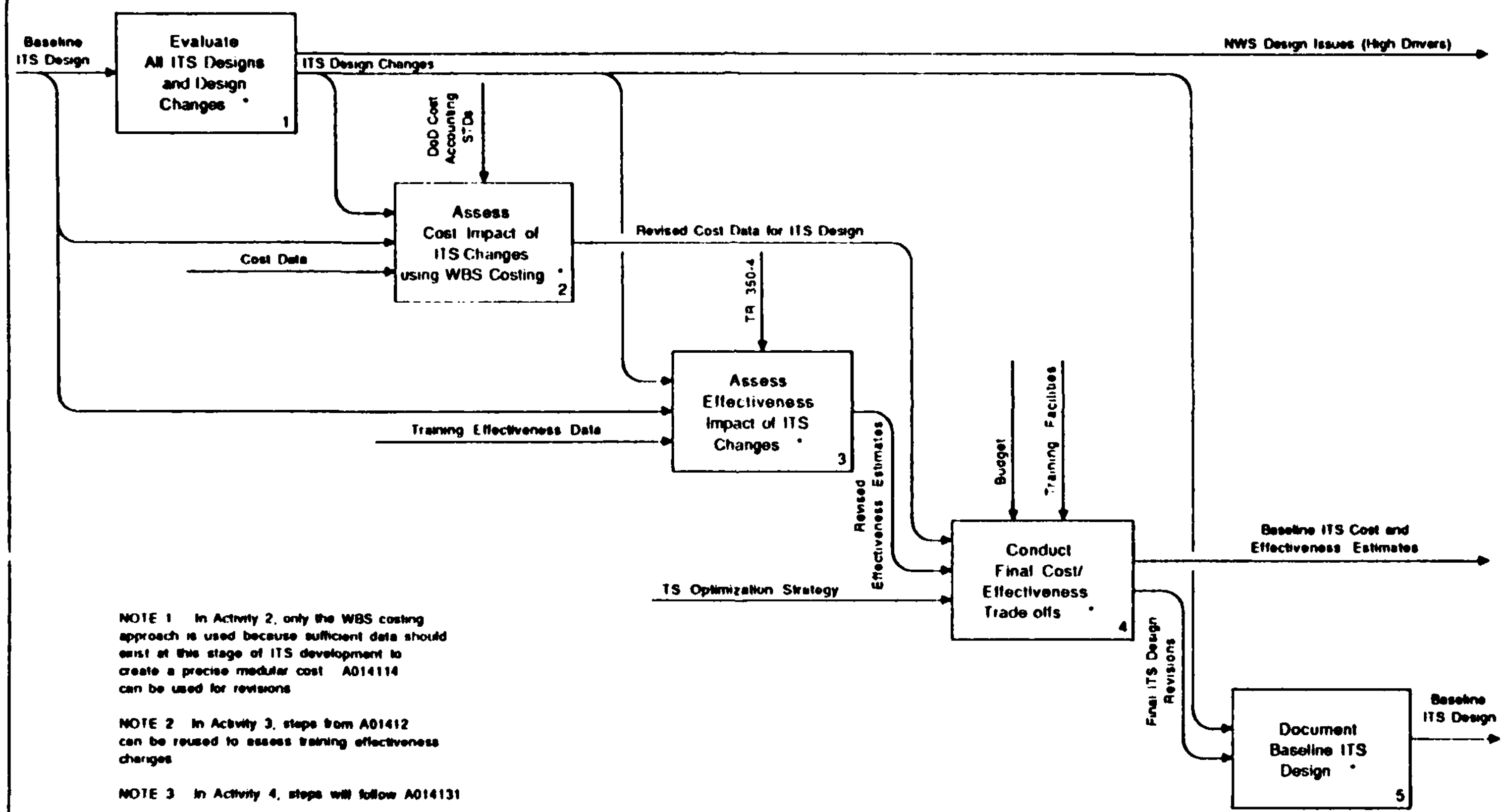


NOTE 1 In Activity 2, only the WBS costing approach is used because sufficient data should exist at this stage of ITS development to create a precise modular cost A014114 can be used for revisions

NOTE 2 In Activity 3, steps from A01412 can be reused to assess training effectiveness changes

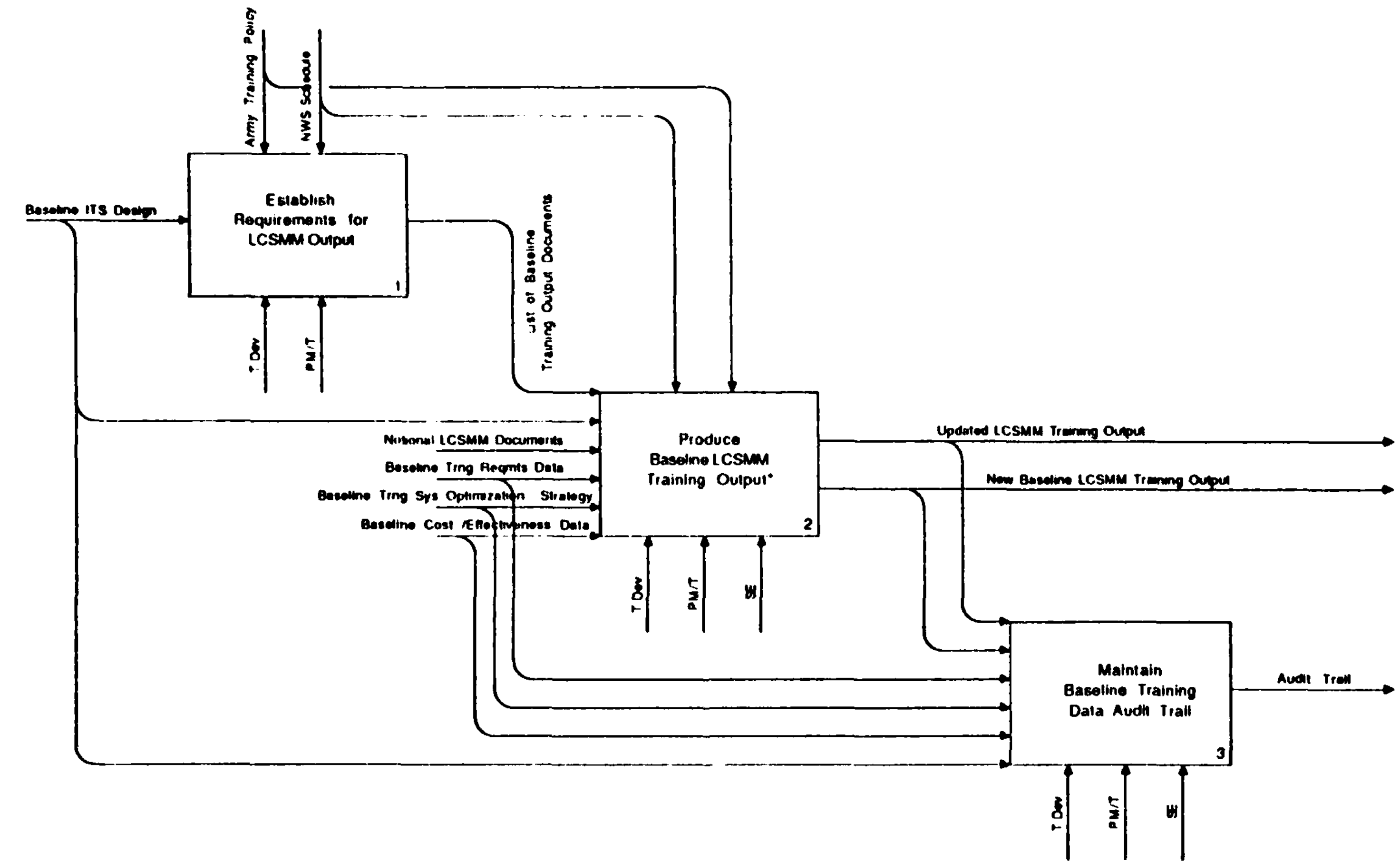
NOTE 3 In Activity 4, steps will follow A014131

NODE:	TITLE:	NUMBER:
TRASER A0251	Revise CTEA for Baseline ITS	

TRASER A0251 REVISE CTEA FOR BASELINE ITS

In this activity, the notional Cost-Training Effectiveness Analysis (CTEA) is revised, based on identified ITS changes. Both cost and effectiveness analyses are revised to reflect current data. A trade-off is included in the process to allow trades between cost and effectiveness, as was done in the notional CTEA. The final step is to document all information about the ITS for use in the next step A026, PRODUCE BASELINE LCSMM TRAINING OUTPUTS.

USED AT: San Diego	AUTHOR: Feuge PROJECT: TRASER NOTES: 1 2 3 4 5 6 7 8 9 10	DATE: 1/15/90 REV: 1	WORKING DRAFT RECOMMENDED PUBLICATION	READER DATE	CONTEXT: A02

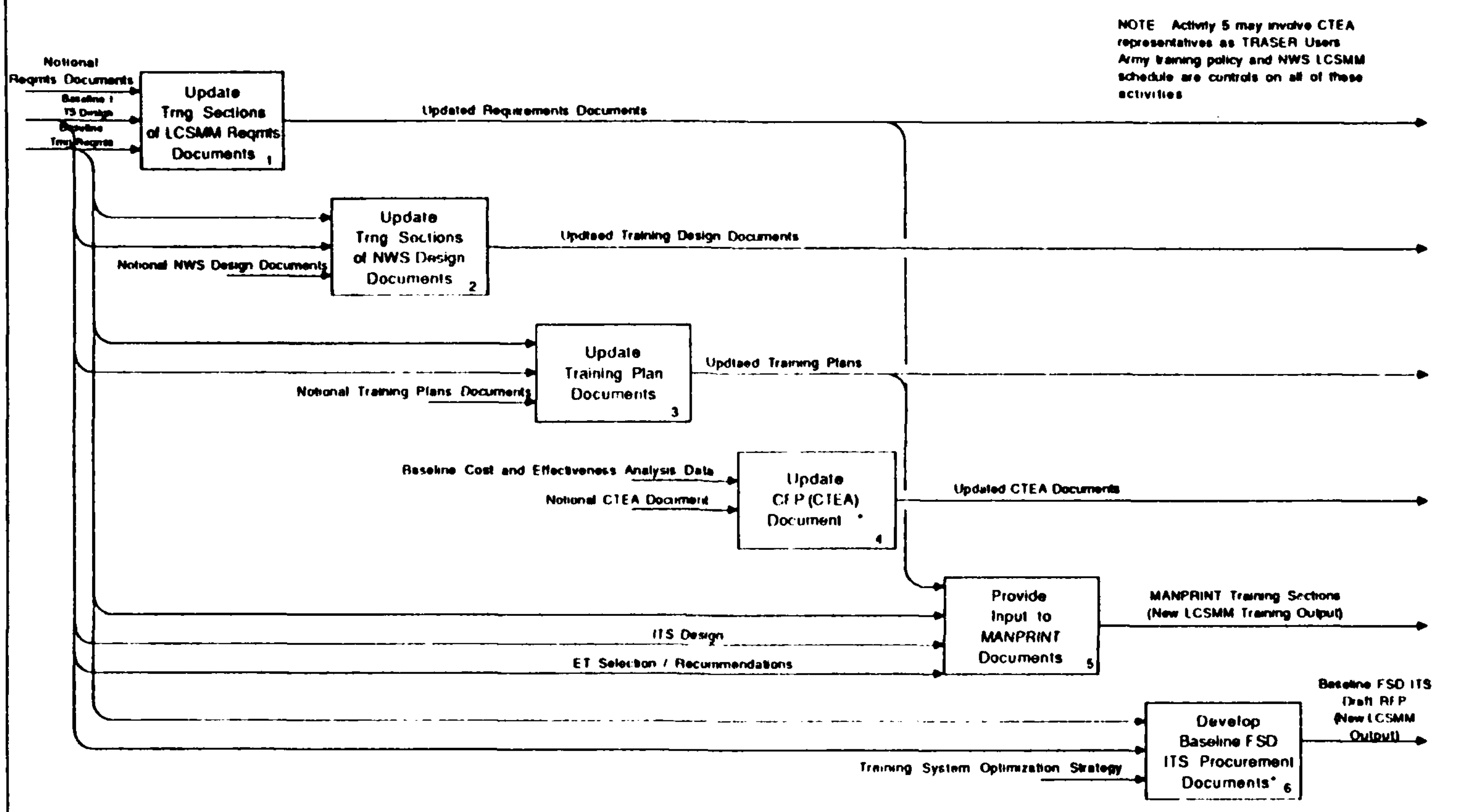


NODE: TRASER A026	TITLE: Produce Baseline LCSMM Training Outputs	NUMBER:

TRASER A026 PRODUCE BASELINE LCSMM TRAINING OUTPUT

In this activity, the training developer must use all ITS data to produce various LCSMM output required by AR 70-1 and TRADOC Reg 70-2 which govern the LCSMM process. These documents establish the requirements for NWS program documents, including training. In addition, this activity creates and maintains an audit trail of important training data during the Demonstration and Validation phase.

USED AT: San Diego	AUTHOR: Feuge PROJECT: TRASER NOTES: 1 2 3 4 5 6 7 8 9 10	DATE: 1/15/90 REV: 2		WORKING DRAFT RECOMMENDED PUBLICATION	READER	DATE	CONTEXT: A026



NODE: TRASER A0261 *	TITLE: Generate LCSMM Output	NUMBER:

TRASER A0261 GENERATE LCSMM OUTPUT

In this activity, various documents and sections of documents must be created and output to specific Army agencies that reflect the current status of ITS development. These documents are requirements documents, design documents, training plans, CFP documents, MANPRINT documents, and procurement documents.

USED AT:	AUTHOR: Feuge	DATE: 1/15/90	WORKING	READER	DATE	CONTEXT:
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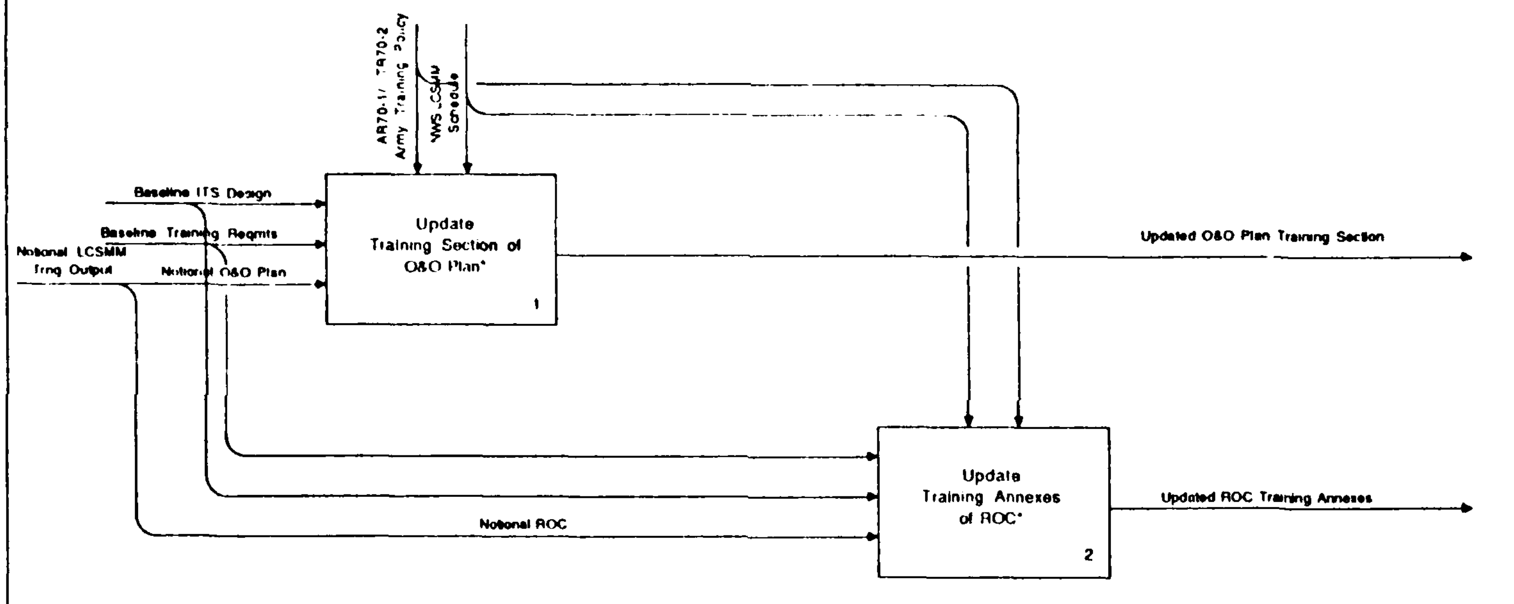
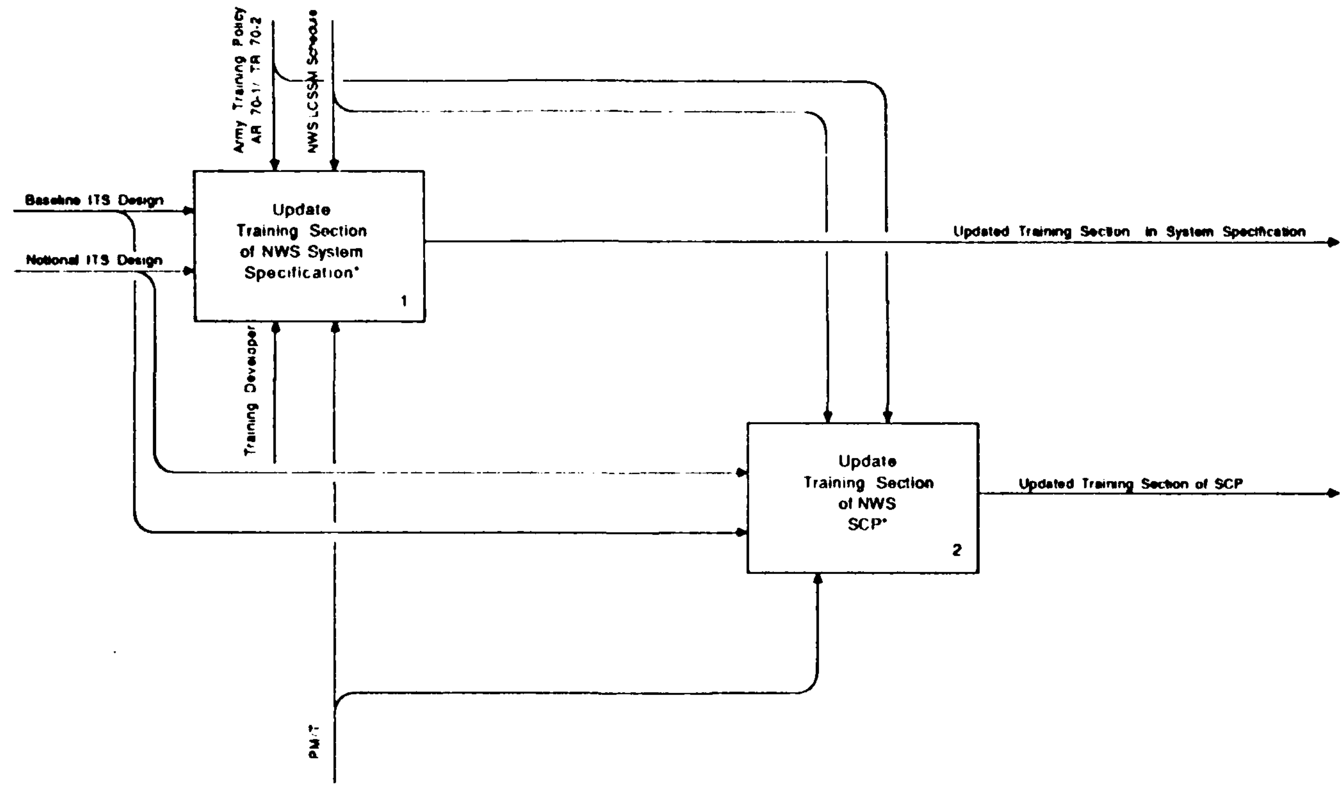


NODE:	TITLE:	NUMBER:
TRASER A02611	Update Training Section of LCSMM Requirements Documents	

TRASER A02611 UPDATE TRAINING SECTION OF LCSMM REQUIREMENTS DOCUMENTS

In this step, the O&O Plan and the training annexes to the ROC must be updated.

USED AT:	AUTHOR: Feuge	DATE: 1/15/90		WORKING	READER	DATE	CONTEXT:
San Diego	PROJECT: TRASER	REV: 1		DRAFT			A0261
	NOTES: 1 2 3 4 5 6 7 8 9 10			RECOMMENDED			
				PUBLICATION			

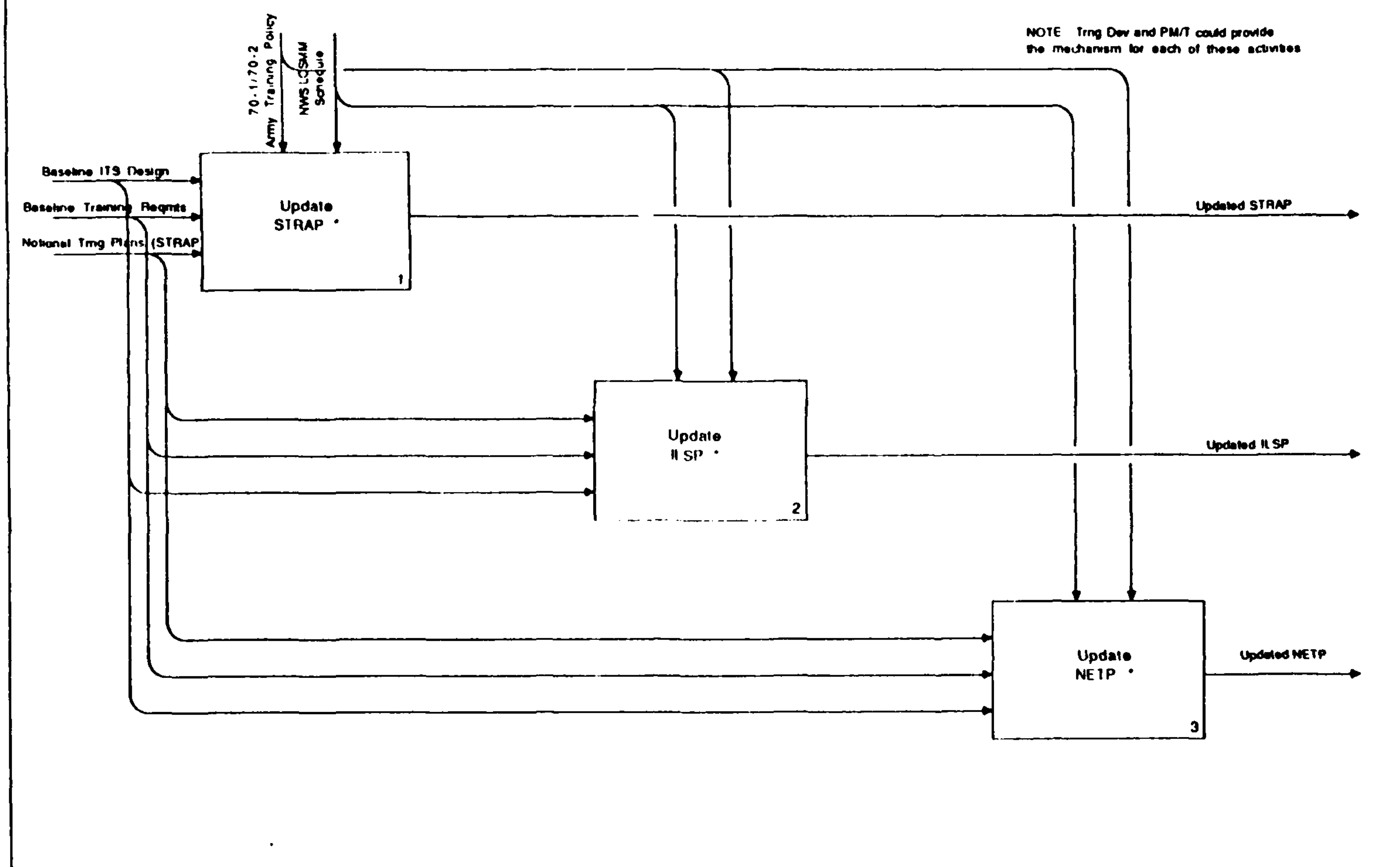


NODE:	TITLE:	NUMBER:
TRASER A02612	Update Training Section of NWS Design Documents	

TRASER A02612 UPDATE TRAINING SECTION OF NWS DESIGN DOCUMENTS

In this activity, the training section of the NWS System Specification and the System Concept Paper (SCP) must be updated.

USED AT: San Diego	AUTHOR: Feuge PROJECT: TRASER NOTES: 1 2 3 4 5 6 7 8 9 10	DATE: 1/15/90 REV: 1		WORKING DRAFT RECOMMENDED PUBLICATION	READER	DATE	CONTEXT: A0261



NODE: TRASER A02613	TITLE: Update Training Plan Documents	NUMBER:

TRASER A02613 UPDATE TRAINING PLAN DOCUMENTS

In this activity, the STRAP, the ILSP, and NETP must be updated to reflect current status of training development.

USED AT:	AUTHOR: Feuge	DATE: 1/15/90		WORKING	READER	DATE	CONTEXT:
San Diego	PROJECT: TRASER	REV: 1		DRAFT			A0261
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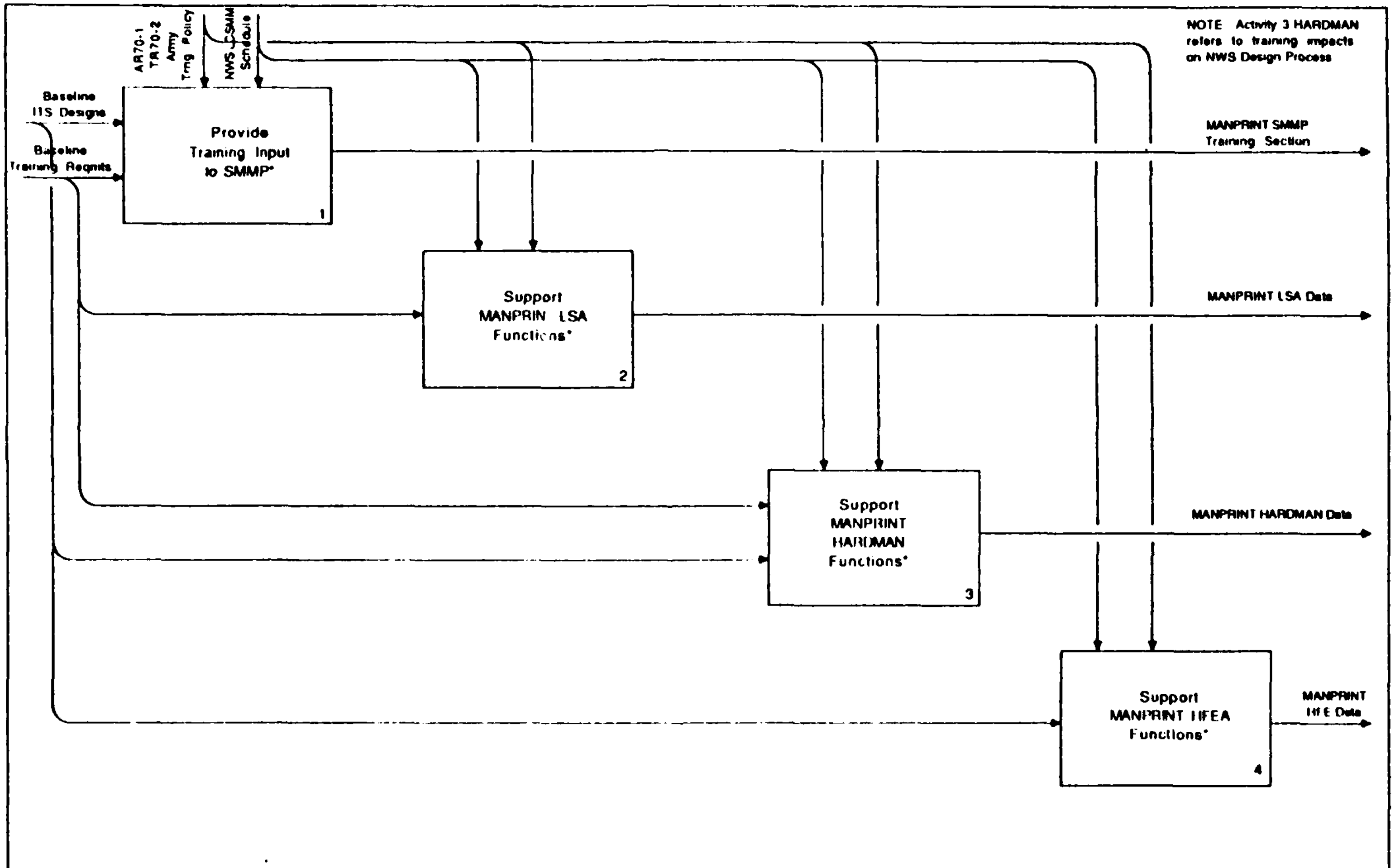
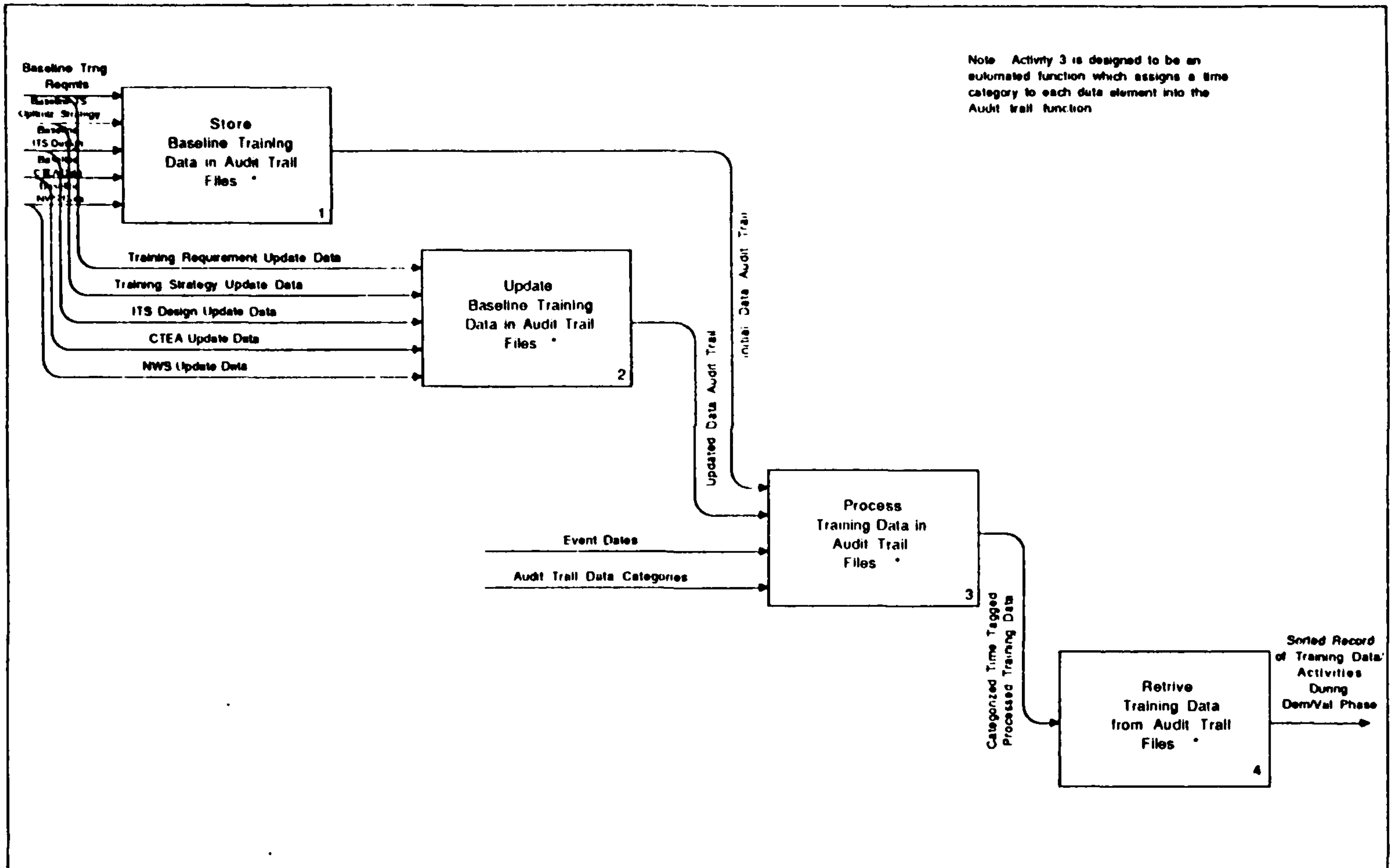


NODE:	TITLE:	NUMBER:
TRASER A02615 •	Provide Input to MANPRINT Training Documents	

TRASER A02615 PROVIDE INPUT TO MANPRINT TRAINING DOCUMENTS

In this activity, MANPRINT documents such as the SMMP, LSA analyses, and HARDMAN must be supported with current training data. In addition, training data may be required to support on-going HFE analyses as well.

USED AT: San Diego	AUTHOR: Feuge PROJECT: TRASER NOTES: 1 2 3 4 5 6 7 8 9 10	DATE: 1/15/90 REV: 1		WORKING DRAFT RECOMMENDED PUBLICATION	READER	DATE	CONTEXT: A026



NODE: TRASER A0263	TITLE: Maintain Baseline Training Data Audit Trail	NUMBER:

TRASER A0263 MAINTAIN BASELINE TRAINING DATA AUDIT TRAIL

In this activity, the capability of creating and using an audit trail for training data is provided in TRASER. This capability satisfies one of the AMAA- cited deficiencies about present NWS training system development practices by creating and maintaining files about the development process. As training output, both for internal and external use, are developed during Demonstration and Validation, TRASER will automatically store them in the appropriate audit trail files. This audit trail is part of the audit trail first developed in A0153, MAINTAIN NOTIONAL TRAINING DATA AUDIT TRAIL.

USED AT:	AUTHOR: Braby	DATE: 1/8/90		WORKING	READER	DATE	CONTEXT:
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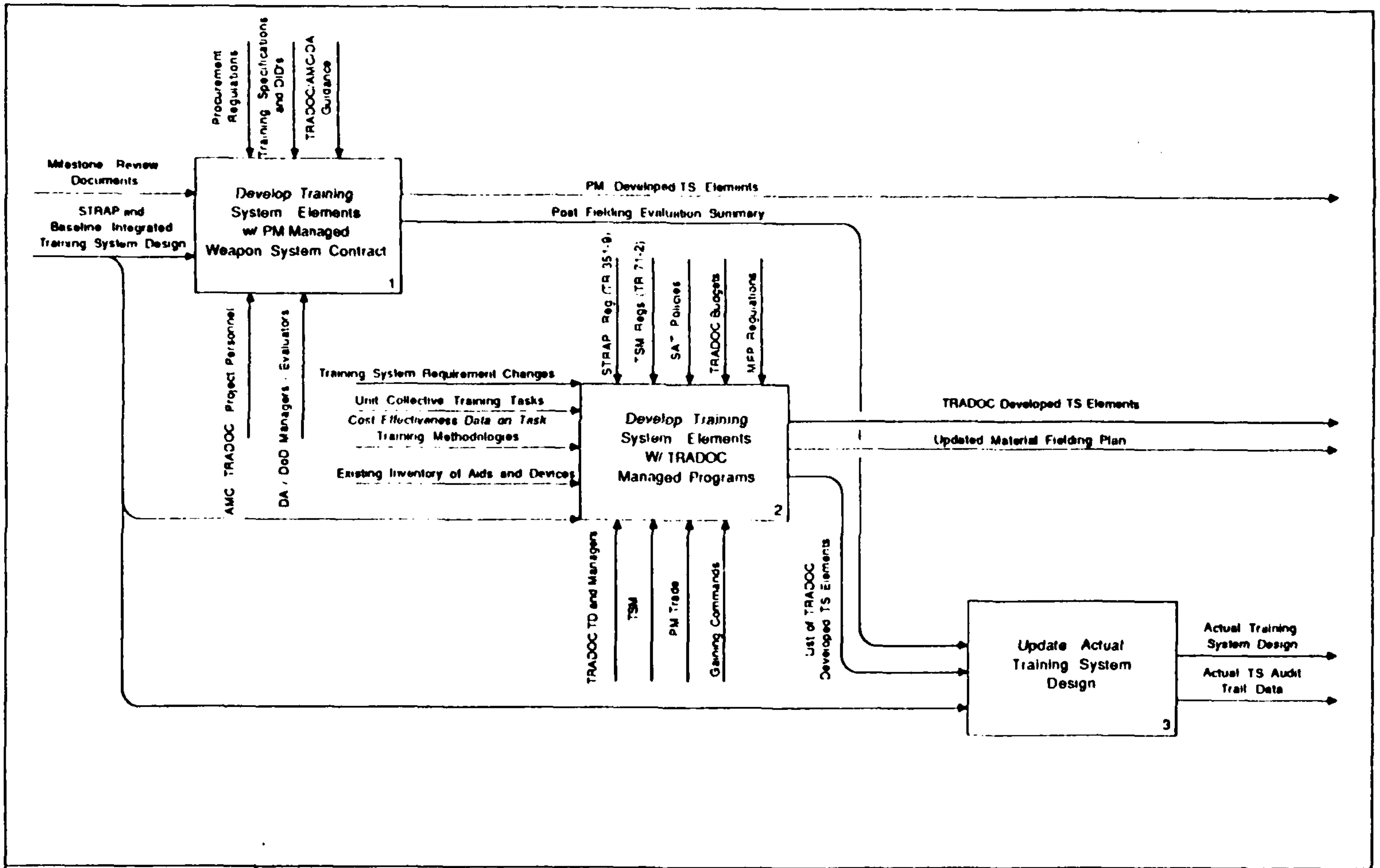

NODE:	TITLE:	NUMBER:
TRASER A03	Develop and Evaluate Actual Training System Design	

TRASER A03 DEVELOP AND EVALUATE ACTUAL TRAINING SYSTEM DESIGN

Based on the Baseline Training System Design, the weapon system Program Manager contracts for the full scale development of major elements of a training system as well as the new weapon system. PM TRADE may act as an agent of the weapon system program manager in the development of training devices. At the same time, various offices within TRADOC develop products that are elements in this same weapon system training program. The efforts of the PM, TRADOC training developers, and the contractor are carefully coordinated. As the PM, the contractor, and the TRADOC training developers create the actual plans and materials with which to conduct weapon system training, decisions are made to vary from the Baseline Training System Design. The record of the training system design that is actually developed by the contractor and TRADOC is called the Actual Training System Design for IOC. The high level activities to produce all the elements of this training system, and to create a record of the evolving design, are depicted in the following diagrams.

USED AT: Winter Park	AUTHOR: Braby	DATE: 1/8/90		WORKING	READER	DATE	CONTEXT: A03
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	NOTES: 1 2 3 4 5 6 7 8 9 10			RECOMMENDED			
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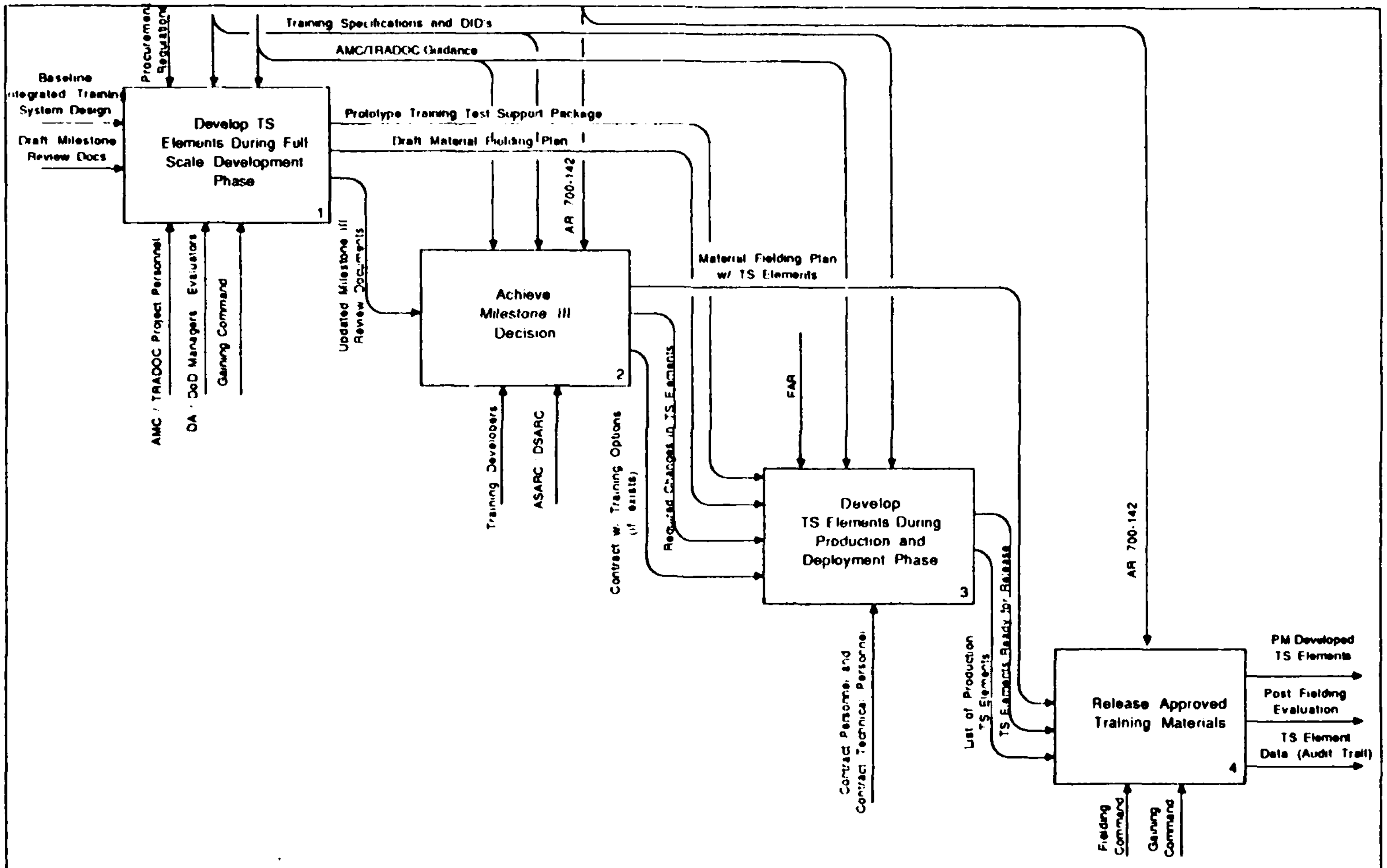

NODE: TRASER A031

TITLE: Develop Training System Elements w/ PM Managed Wpn System Contract

NUMBER:

TRASER A031 DEVELOP TRAINING SYSTEM ELEMENTS WITHIN THE PM MANAGED WEAPON SYSTEM CONTRACT

The broad activities depicted in this diagram concern the PM's efforts to contract for the development and production of training system elements during the full scale development, and then the production phases of the weapon system contracts. It starts with training development activities performed immediately following a milestone II decision to go to full scale development of the weapon system, and ends with the training activities associated with the delivery of the first production units of the weapon system and the achievement of Initial Operational Capability (IOC). The major purpose of this diagram is to divide this broad scope of activity into smaller programs that can be described in subsequent diagrams. While the Baseline Training System Design is used in initiating this effort, the contractor makes detailed decisions concerning the training system design during full scale development, and to a lesser extent during the production of the weapon system. These changes in the training system design, reflecting the actual developed training system elements, are incorporated into the Actual Training System Design at IOC.

USED AT:	AUTHOR: Braby	DATE: 1/8/90	WORKING	READER	DATE	CONTEXT:
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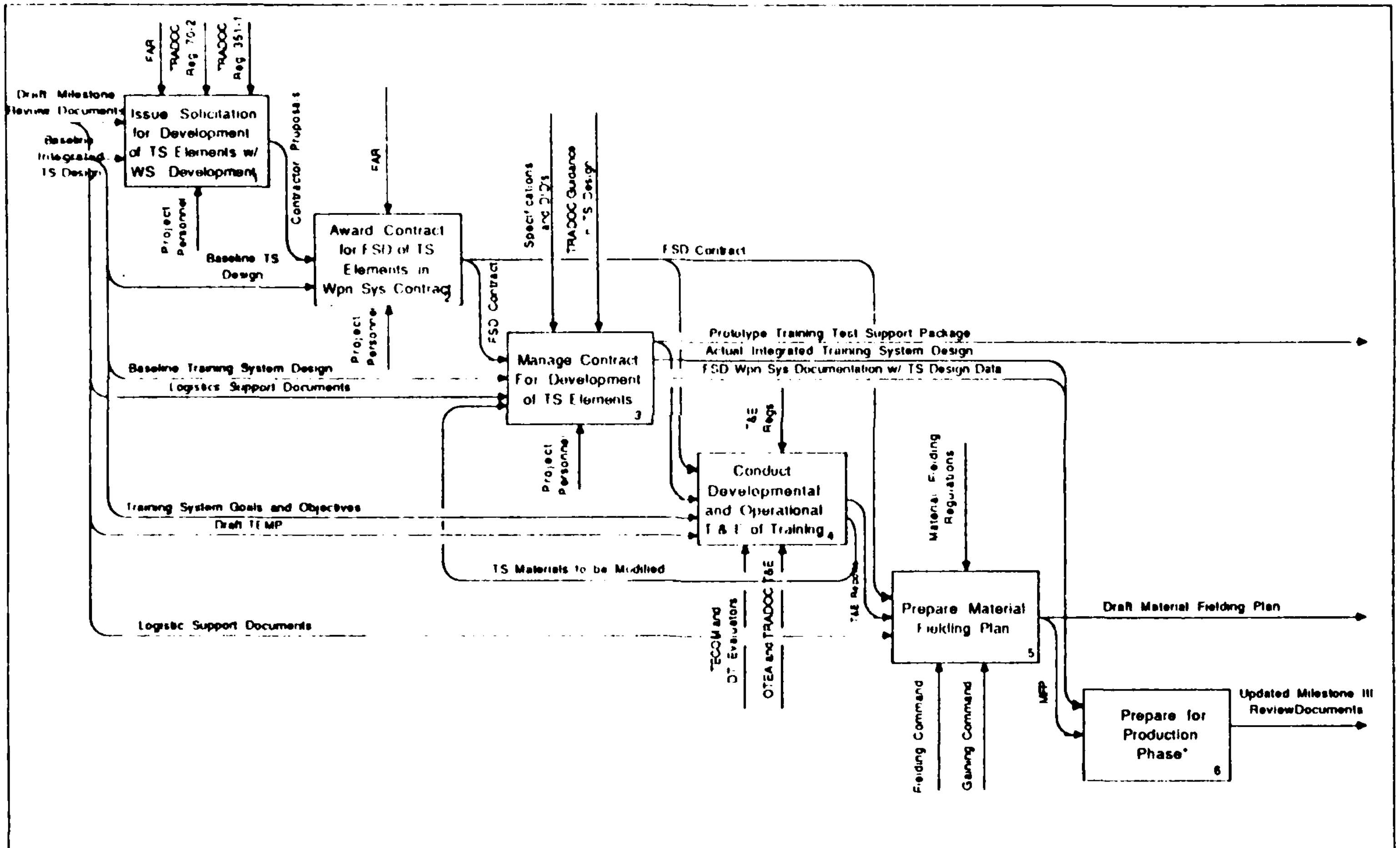

NODE:	TITLE:	NUMBER:
TRASER A0311	Develop Training System Elements During Full Scale Development Phase	

TRASER A0311 DEVELOP TRAINING SYSTEM ELEMENTS DURING FULL SCALE DEVELOPMENT PHASE

The activities depicted in this diagram concern the contracting process used by the PM in developing the prototype Training Test Support Package which will support developmental and operational testing of the prototype weapon system. Also, this package will undergo operational testing for suitability as the PM's contribution to the training system supporting the operation, maintenance, and support of the production weapon system. Based on the results of this testing and use of the prototype Training Test Support Package, modifications to the training system design elements are made in preparation for full scale production of the weapon system and supporting training system. Changes in the training system design may be reflected in the Milestone III review documents and in the draft Materiel Fielding Plan.

USED AT:	AUTHOR: Braby	DATE: 1/8/90		WORKING	READER	DATE	CONTEXT:
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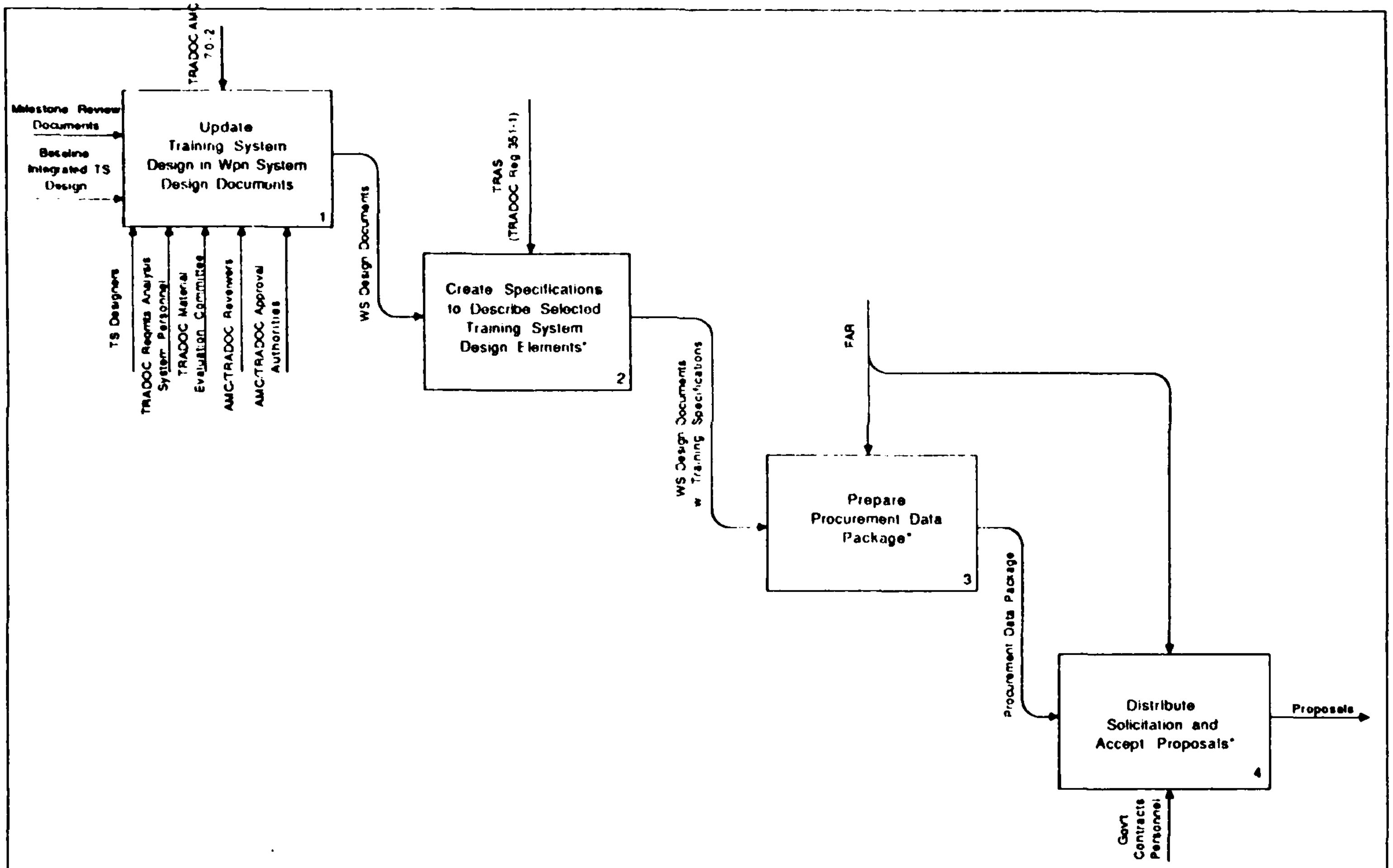

NODE:	TITLE:	NUMBER:
TRASER A03111	Issue Solicitation for Development of Training System Elements w/ Weapon System Development	

TRASER A03111 ISSUE SOLICITATION FOR DEVELOPMENT OF TRAINING SYSTEM ELEMENTS WITHIN WEAPON SYSTEM DEVELOPMENT

This diagram shows the major activities that go into the PM's solicitation effort to create a solicitation package for the development of training elements, for the distribution of this solicitation, and the receiving of proposals. The diagram is used to isolate the specific detailed operations involved in updating the training system design documents included in the solicitation, and described in greater detail in the lower level diagram A031111. In this activity, issue includes the activities necessary to prepare, distribute, and receive responses.

USED AT:	AUTHOR: Braby	DATE: 1/8/90		WORKING	READER	DATE	CONTEXT:
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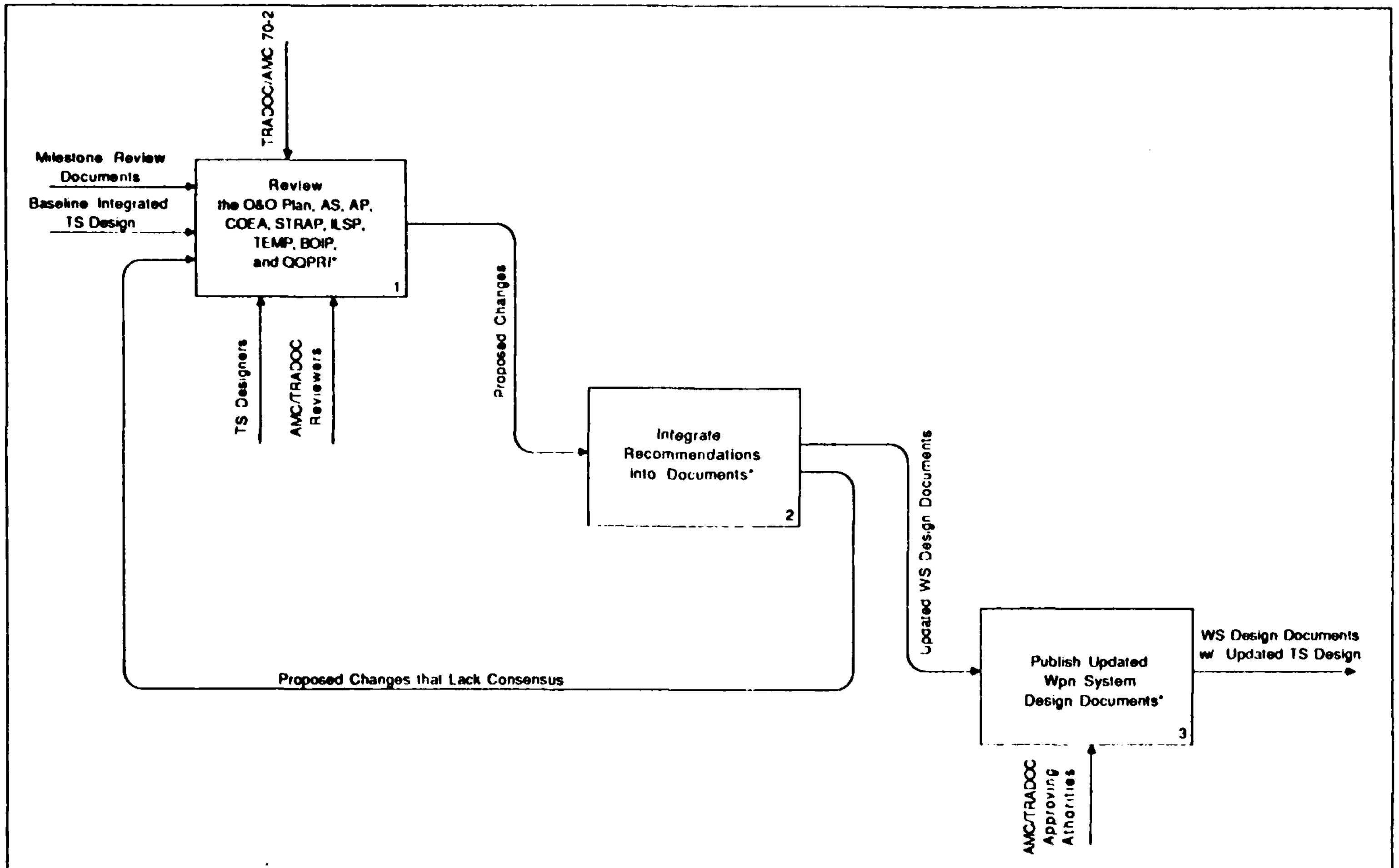

NODE:	TITLE:	NUMBER:
TRASER A031111	Update Training System Design in Weapon System Design Documents	

TRASER A031111 UPDATE TRAINING SYSTEM DESIGN IN WEAPON SYSTEM DESIGN DOCUMENTS

The Milestone II review documents contain statements that are training requirements and impact, either directly or indirectly, the selection of training system design elements. These documents include the O&O Plan, Acquisition Strategy (AS), Acquisition Plan (AP), Cost and Operational Effectiveness Analysis (COEA), System Training Plan (STRAP), Integrated Logistic Support Plan (ILSP), Test and Evaluation Master Plan (TEMP), Basis of Issue Plan (BOIP), and the Qualitative and Quantitative Personnel Requirements Information (QQPRI). The planning that has gone into the development of the Baseline Training System Design is expressed as requirements in these documents. At this time they are reviewed to identify required changes needed to ensure that the documents are responsive to the current training needs and constraints.

USED AT:	AUTHOR: Braby	DATE: 1/8/90		WORKING	READER	DATE	CONTEXT:
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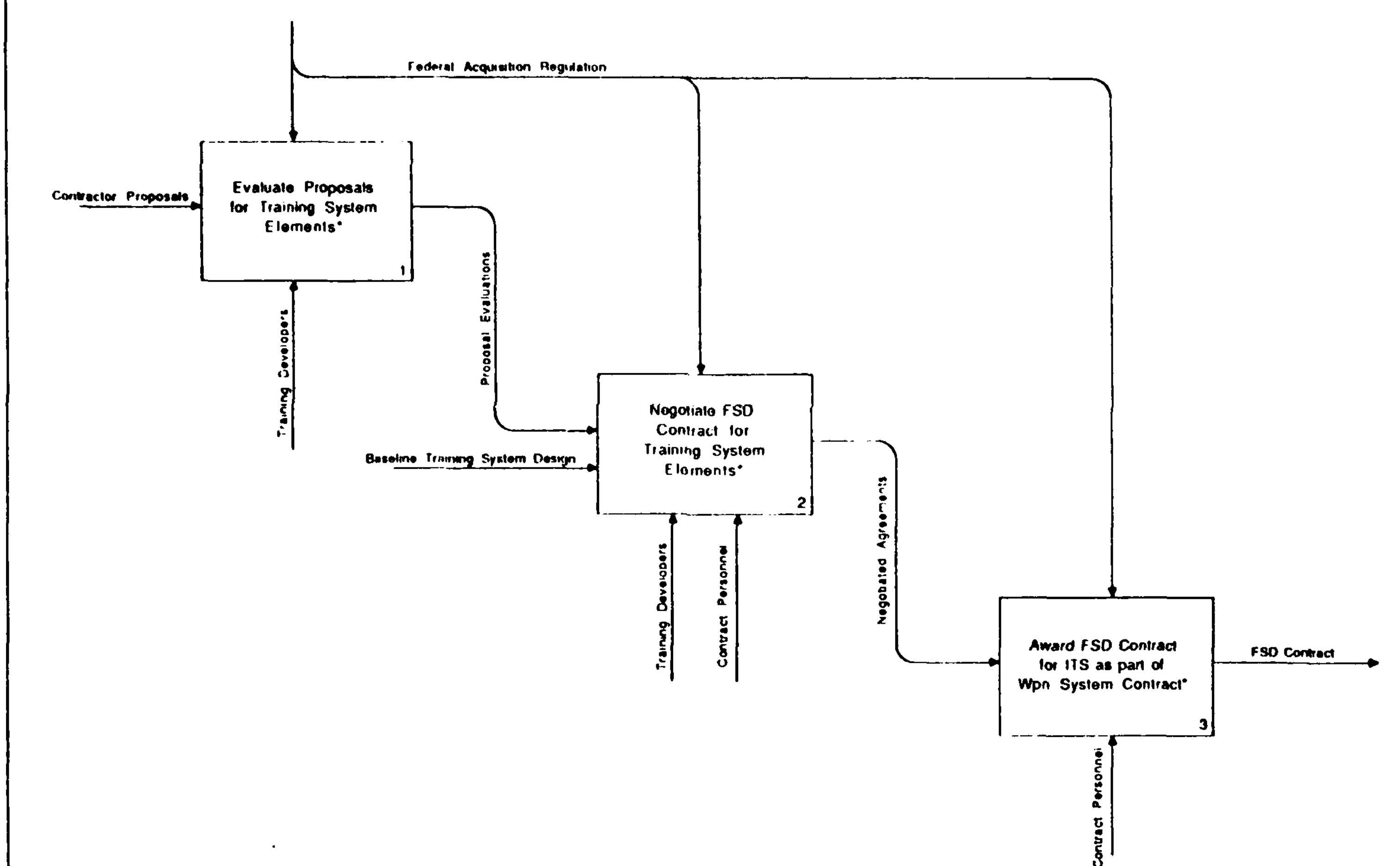

NODE:	TITLE:	NUMBER:
TRASER A03112	Award Contract for FSD of Training System Elements in Weapon System Contract	

TRASER A03112 AWARD CONTRACT FOR FSD OF TRAINING SYSTEM ELEMENTS IN WEAPON SYSTEM CONTRACT

Major training system design decisions are often made during the evaluation of training elements in weapon system proposals, and in the negotiation and award of the contract to develop the weapon system and the accompanying training supports. The extent that the proposals define a unique set of training elements depends on the way the Request for Proposals is written, (i.e., some RFPs call for those offering proposals to come up with an optimum mix of training elements, leaving major training design decisions to the contractor). Innovative solutions to training requirements may be presented. Through negotiation, the characteristics of the training system elements may be defined or redefined. The Baseline Training System Design and the evaluations of the proposals can serve as guidance in negotiating the detailed contract descriptions of the training system elements to be produced under the PM weapon system full scale development contract.

USED AT:	AUTHOR: Braby	DATE: 1/8/90		WORKING	READER	DATE	CONTEXT:
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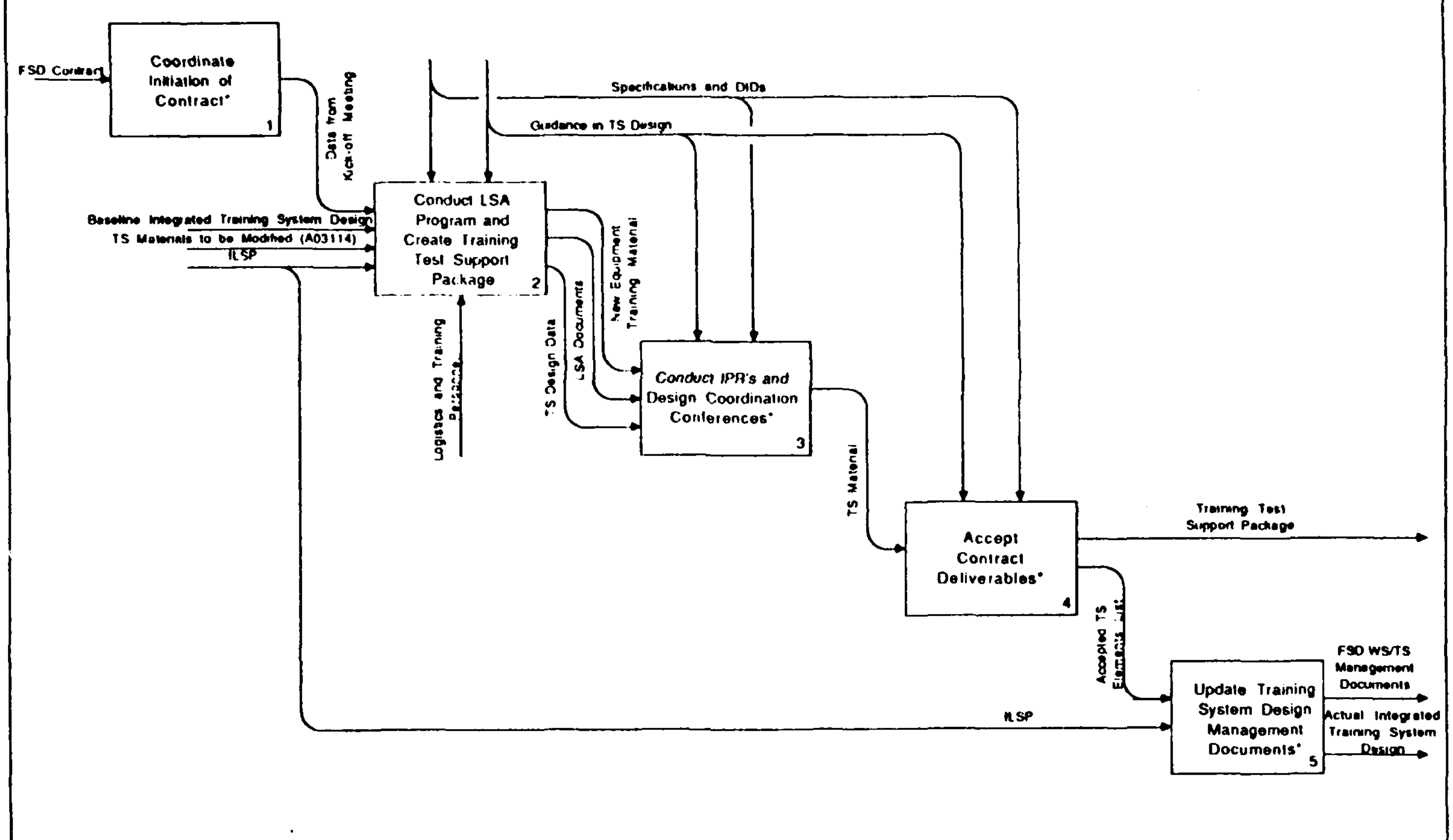

NODE:	TITLE:	NUMBER:
TRASER A03113	Manage Contract for Development of Training System Elements	

TRASER A03113 MANAGE CONTRACT FOR DEVELOPMENT OF TRAINING SYSTEM ELEMENTS

The training system design undergoes further refinements as the contractor carries out the terms of the full scale development contract. The contractor builds the training test support package, along with the full scale development of the new weapon system. The government representatives for training development perform a variety of functions including (1) coordination at the initiation of the contract, (2) ongoing review of logistic support data as it is generated during weapon system development, (3) participation in the various IPRs and design coordination conferences, and (4) the evaluation and acceptance of deliverables. All these ongoing activities impact the training system design as contingencies are confronted and resolved. As a result of this process, the Baseline Training System Design is revised by the training developers and becomes the Actual Integrated Training System Design. The various documents such as the STRAP are modified by the appropriate training developers to reflect these changes.

USED AT:	AUTHOR: Braby	DATE 1/8/90		WORKING	READER	DATE	CONTEXT:
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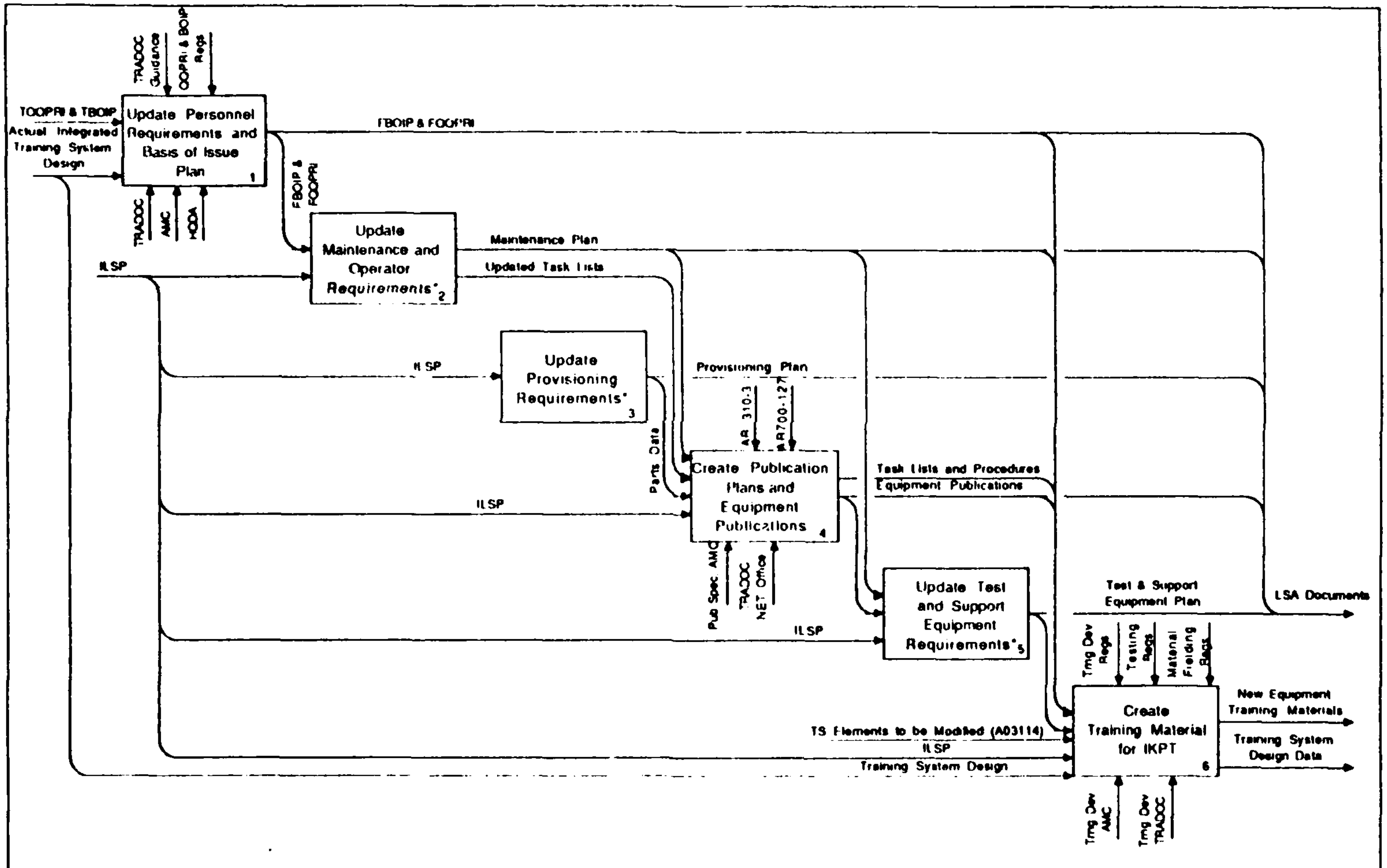

NODE:	TITLE:	NUMBER:
TRASER A031132	Conduct LSA Program and Create Training Test Support Package	

TRASER A031132 CONDUCT LSA PROGRAM AND CREATE TRAINING TEST SUPPORT PACKAGE

This diagram describes the coordinated government and contractor activity in creating the training test support package. As LSA and other weapon system design data becomes available various documents are updated, all of which impact the training system design. Updated documents include the BOIP, QQPRI, maintenance plan, task lists, provisioning plan, publication plan, and test and support equipment plans as well as plans and materials for instructor and key personnel training supporting developmental and operational testing.

USED AT:	AUTHOR: Braby	DATE: 1/8/90		WORKING	READER	DATE	CONTEXT:
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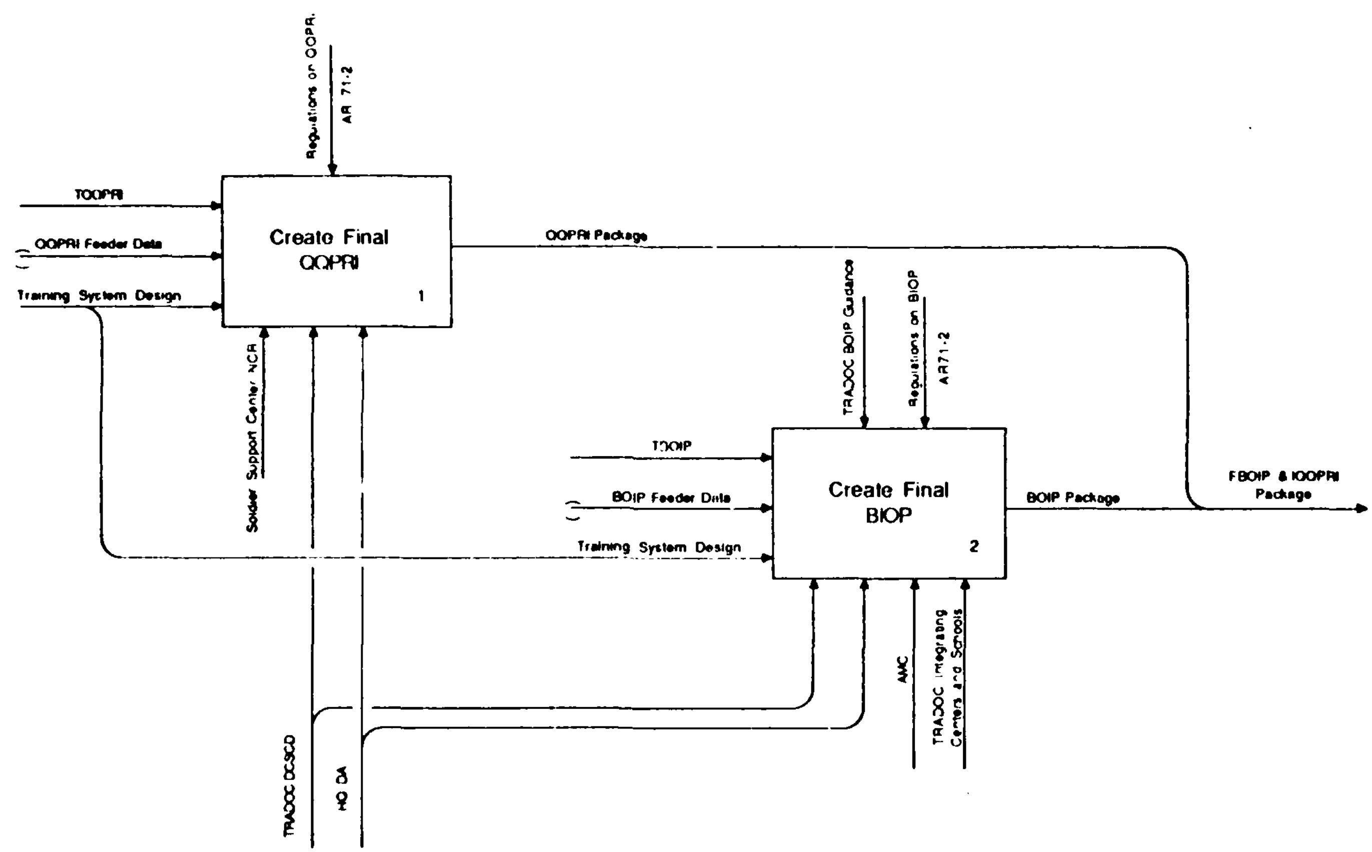
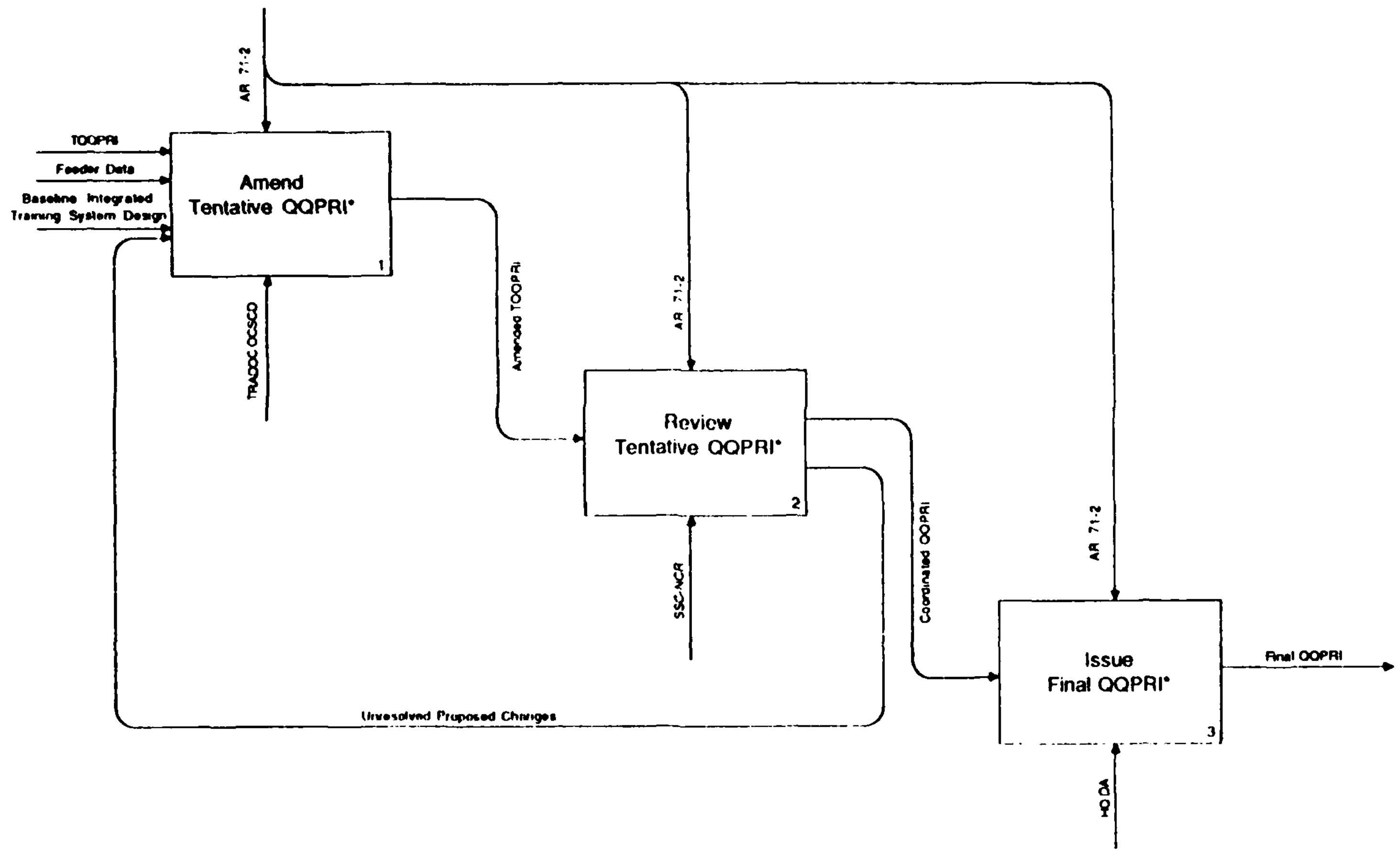


NODE:	TITLE:	NUMBER:
TRASER A0311321	Update Personnel Requirements and Basis of Issue Plan	

TRASER A0311321 UPDATE PERSONNEL REQUIREMENTS AND BASIS OF ISSUE PLAN

The two documents described in this diagram define the requirements for human performance in support of the new weapon system. The Qualitative and Quantitative Personnel Requirement Information (QQPRI) lists the enlisted and officer personnel that will operate and support the weapon system. It lists the duties and qualifications of each type of personnel. The Basis of Issue Plan (BOIP) lists where the weapon systems will be assigned, and in what quantity. The number of personnel with specified skills can be projected based on these data. As feeder data becomes available these plans are revised. The Final BOIP and QQPRI Package is a primary source of data for designing school, unit and distributed training programs to support the maintenance and operation of the new weapon system.

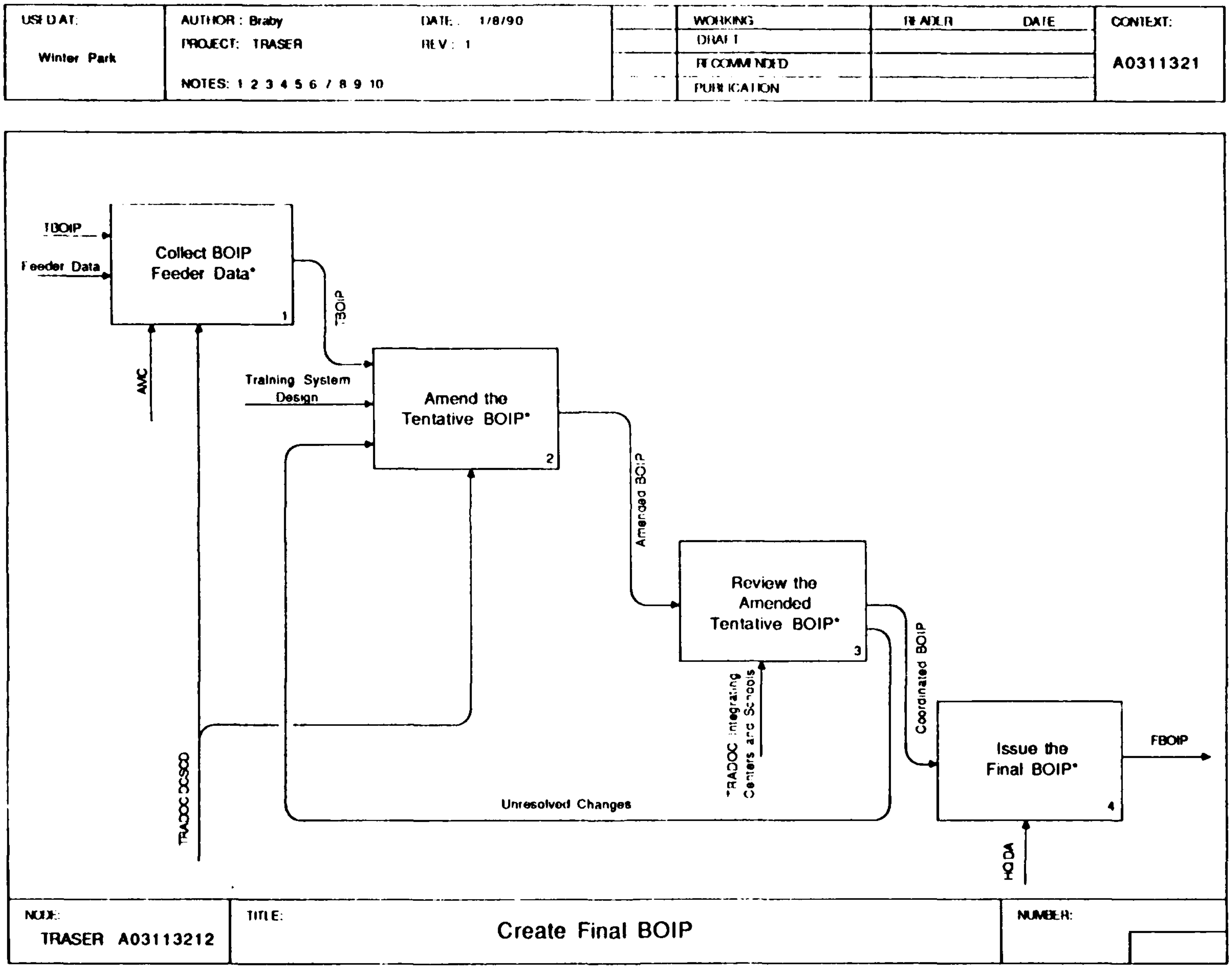
USED AT: Winter Park	AUTHOR: Braby PROJECT: TRASER NOTES: 1 2 3 4 5 6 7 8 9 10	DATE: 1/8/90 REV: 1		WORKING DRAFT RECOMMENDED PUBLICATION	READER	DATE	CONTEXT: A0311321



NODE: TRASER A03113211	TITLE: Create Final QQPRI	NUMBER:

TRASER A03113211 CREATE FINAL QQPRI

The operations for updating the Tentative QQPRI and publishing this updated document as the Final QQPRI are depicted in this diagram. As an input to this process, the Tentative QQPRI, along with feeder data across the entire range of MOS and Officer specialities, are included as documented in the Baseline Integrated Training System Design, i.e., all of the individual Baseline Training System Designs for the various types of personnel that will maintain, operate or support the weapon system.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Winter Park
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PROJECT: TRASER
DATE: 1/8/90
REV: 1
NOTES: 1 2 3 4 5 6 7 8 9 10
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PUBLICATION
READER
DATE
CONTEXT:
A0311321
TBOIP
Feeder Data
Collect BOIP Feeder Data*
1
TBOIP
AMC
Training System Design
Amend the Tentative BOIP*
2
Amended BOIP
Review the Amended Tentative BOIP*
3
TRADOC Integrating Centers and Schools
Coordinated BOIP
Issue the Final BOIP*
4
FBOIP
HQ DA
TRADOC DCSCD
Unresolved Changes
NODE:
TRASER A03113212
TITLE:
Create Final BOIP
NUMBER:

TRASER A03113212 CREATE FINAL BOIP

The operations for updating the Tentative BOIP and publishing this updated document as the Final BOIP are depicted in this diagram. As an input to this process, the Tentative BOIP along with feeder data is used. The proposed amendment is reviewed and revised in a cyclic type of review process as interested organizations revisit the document until it's content stabilizes. It is then issued as the Final BOIP.

USED AT:	AUTHOR: Braby	DATE: 1/8/90		WORKING	READER	DATE	CONTEXT:
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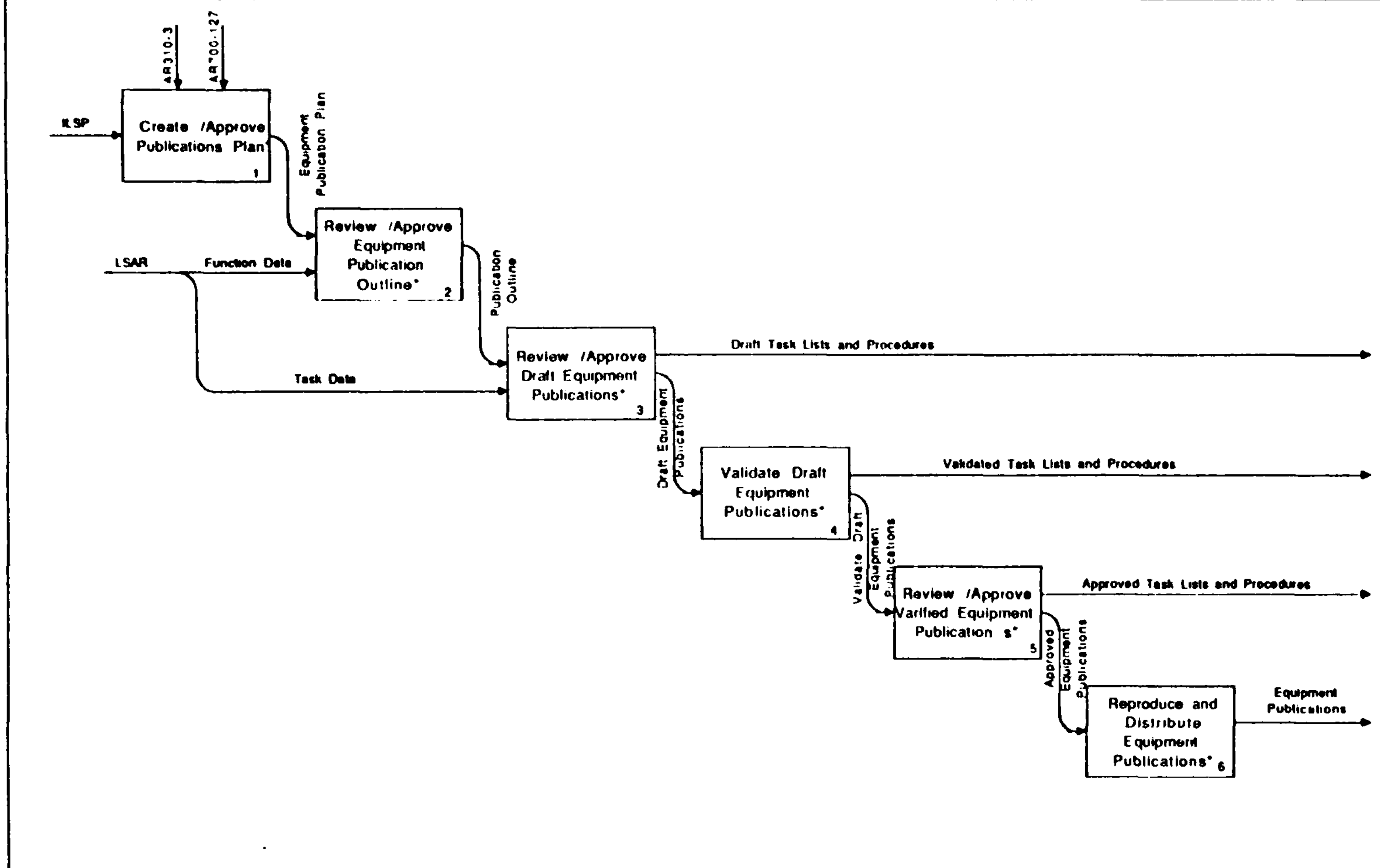

NODE:	TITLE:	NUMBER:
TRASER A0311324	Create Publication Plans and Equipment Publications	

TRASER A0311324 CREATE PUBLICATION PLANS AND EQUIPMENT PUBLICATIONS

Equipment publications are critical training system elements in training programs for the maintenance and operation of weapon systems. Not only are they used as training material in resident school, unit and distributive training programs, they serve as job aids to be used while performing many types of tasks, thereby establishing how tasks will be performed. Draft manuals containing directions for these operations are used in the development of other types of training materials to teach these operations. Some of the decisions made in planning for these publications, and in producing them, impact training. The types of equipment publications to be provided, the tasks to be supported, and policy decisions on how the manuals will be used (such as the requirement that manual procedures will be followed) substantially impact how work is performed and trained. Therefore the design process depicted on this diagram can be considered a training system design process. This process of government review of the publication effort contains the following operations: evaluating publication plans, the approval of publication outlines to define content, the review and approval of draft documents, the validation and approval of equipment publications and the reproduction and distribution of these publications.

USED AT:	AUTHOR: Braby	DATE: 1/8/90		WORKING	READER	DATE	CONTEXT:
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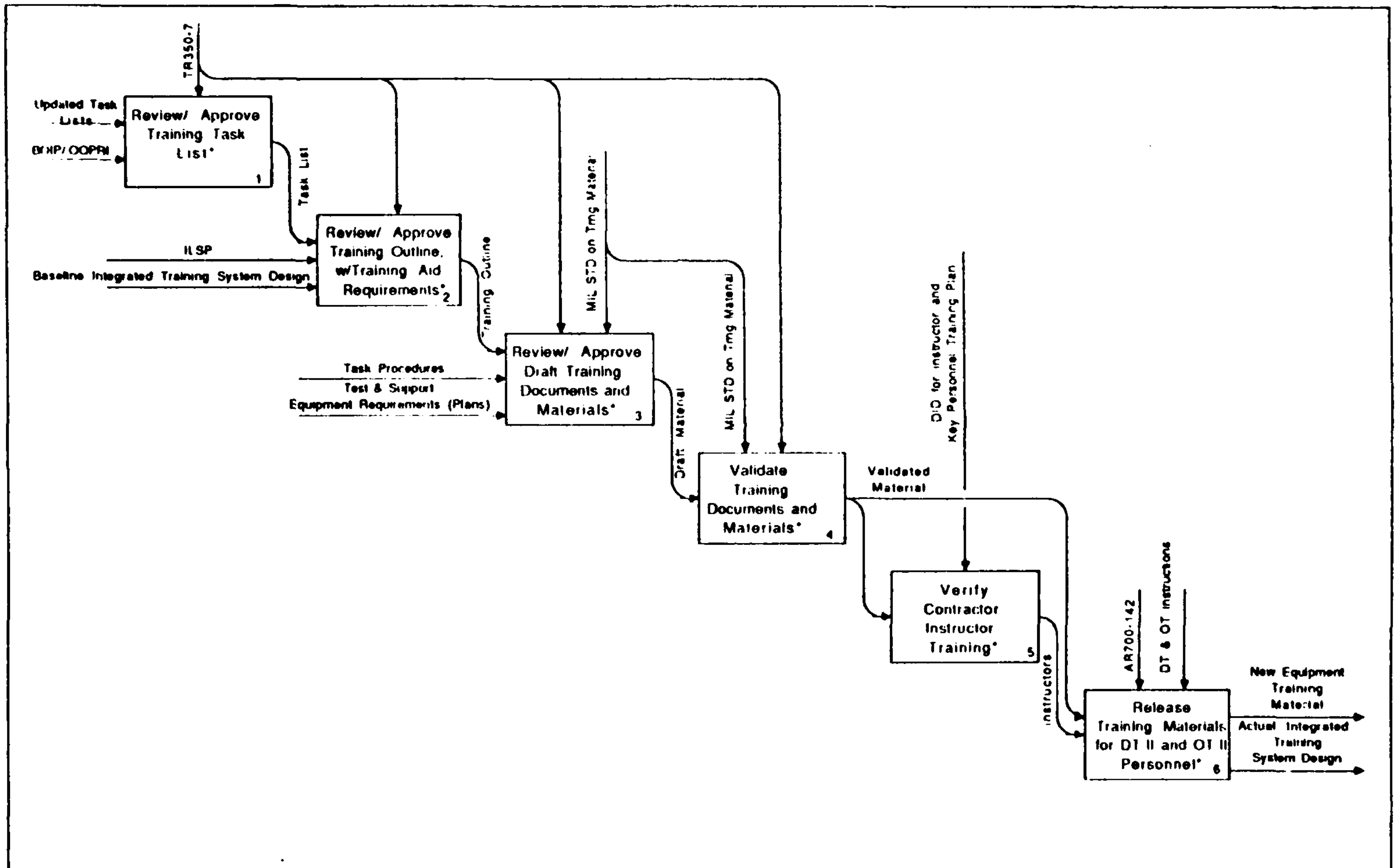
				PUBLICATION			



NODE:	TITLE:	NUMBER:
TRASER A0311326	Create Training Material for Instructor and Key Personnel Training	

TRASER A0311326 CREATE TRAINING MATERIAL FOR INSTRUCTOR AND KEY PERSONNEL TRAINING

Instructors and key personnel who will participate in the developmental and operational testing of a new weapon system must be properly trained before participating in these tests. The Training Test Support Package contains new equipment training materials for this purpose. This package also becomes an input to the follow-on development of training for operator and maintainer personnel during weapon system production. The operations to create these materials are depicted on this diagram. These operations include (1) selecting a list of training tasks, (2) creating training outlines that include training aid requirements, (3) creating the training materials, (4) validating these materials, (5) verifying that the contractor's instructors are qualified to perform the training, and (6) the formal release of these training assets to support the training of personnel to perform the required tests. The Baseline Training System Design will be modified during this process as problems are encountered and resolved.

USED AT:	AUTHOR: Braby	DATE: 1/8/90	WORKING	READER	DATE	CONTEXT:
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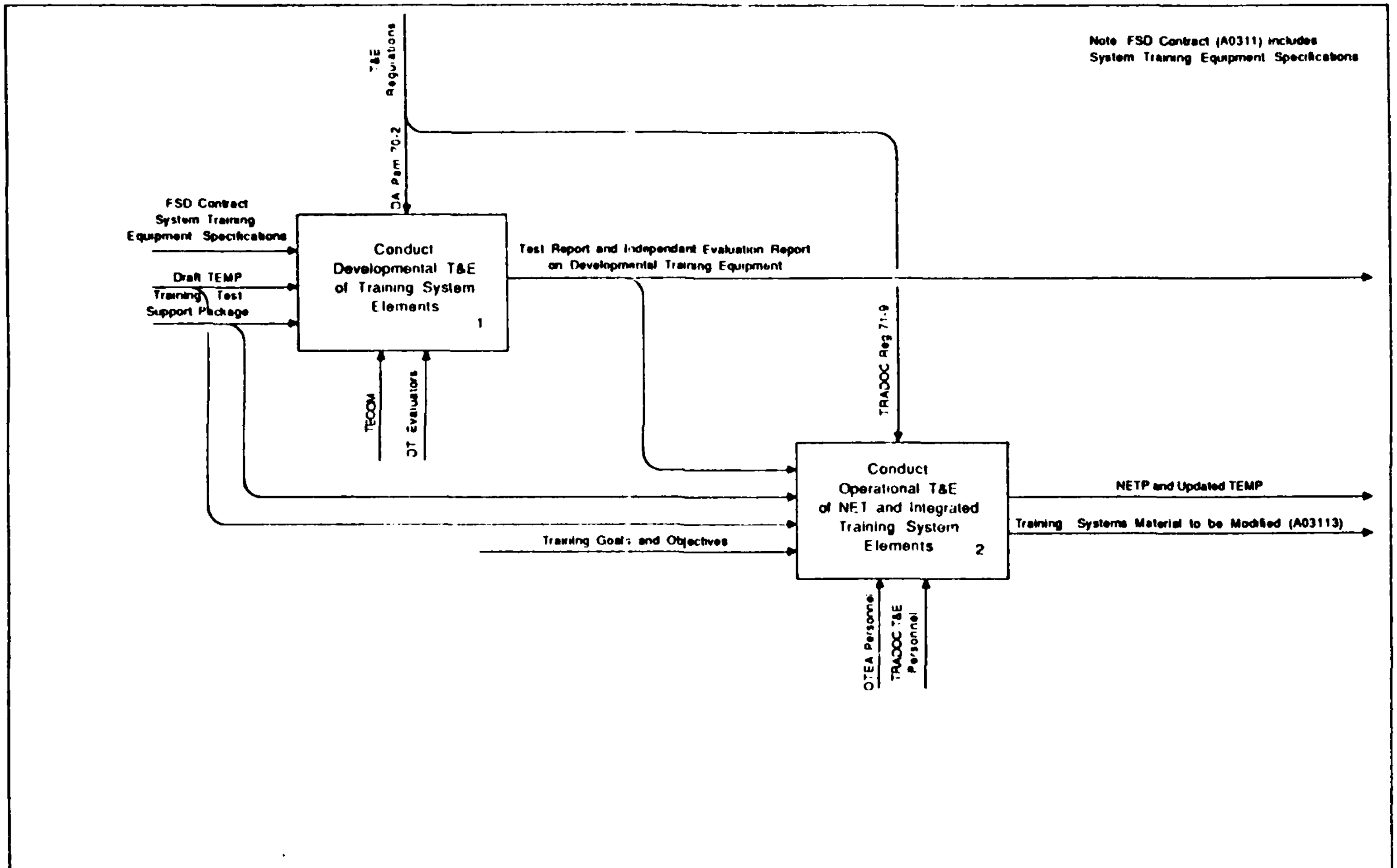

NODE:	TITLE:	NUMBER:
TRASER A03114	Conduct Developmental and Operational T&E of Training	

The activities depicted in this diagram concern the test and evaluation of the independent elements of the Training Test Support Package, and the elements together as a functioning training system. This test and evaluation is performed in two phases, the engineering or developmental type testing of training system elements such as simulators, and the operational testing of system elements to determine if they will achieve training goals in the type of circumstances in which they are intended to be used. Given the training sections of the Test and Evaluation Master Plan, the two types of tests are conducted at appropriate points in the development of the weapon system and related training system. If conducted rigorously the test and evaluation of the training system elements will have a substantial influence on the training system design, in that elements that fail to meet training requirements will be identified for modification or replacement. The output of these activities includes test data, updated New Equipment Training Plan, and specific requirements to update training system elements.

USED AT:	AUTHOR: Braby	DATE 1/8/90		WORKING	READER	DATE	CONTEXT:
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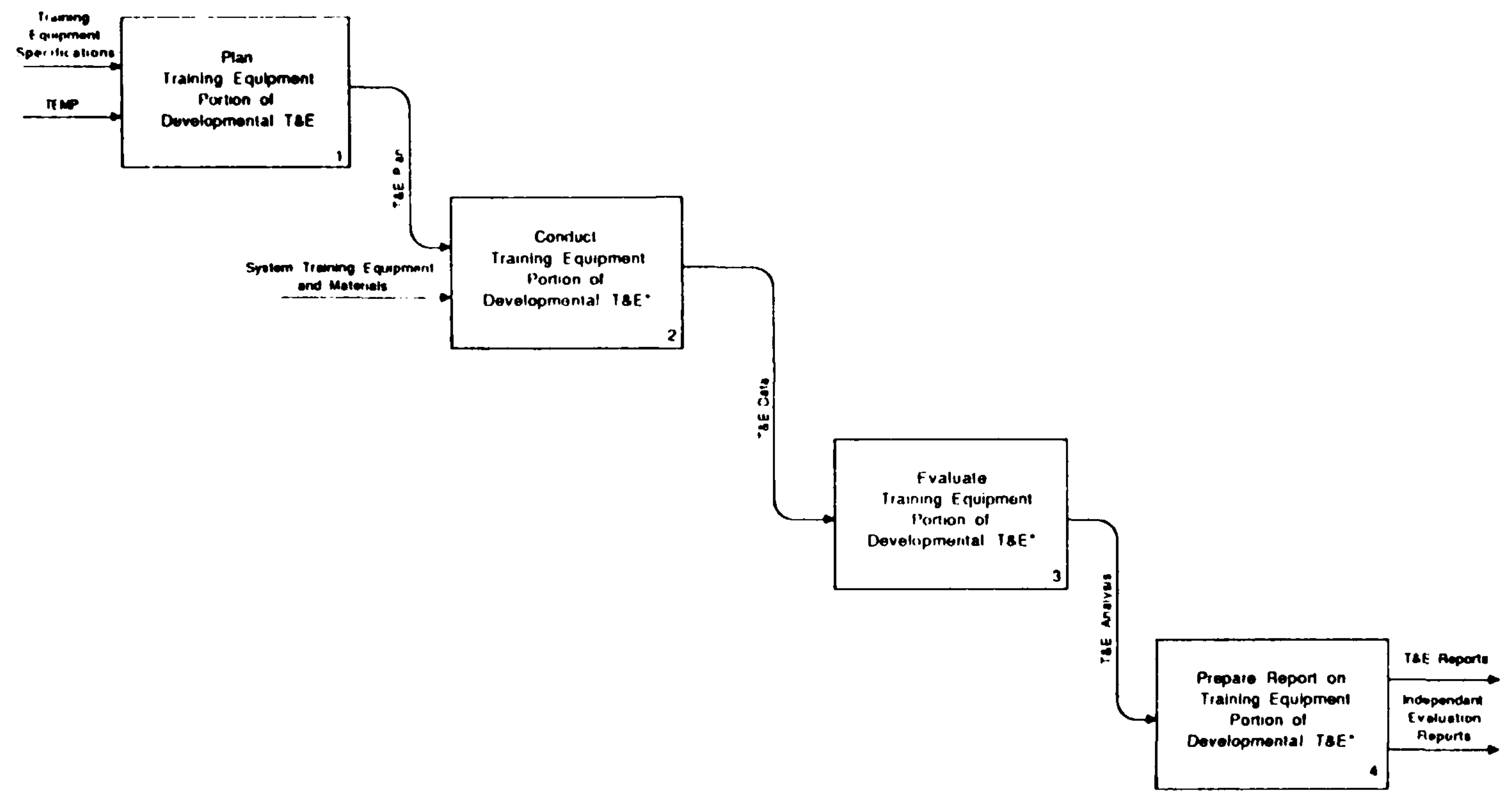
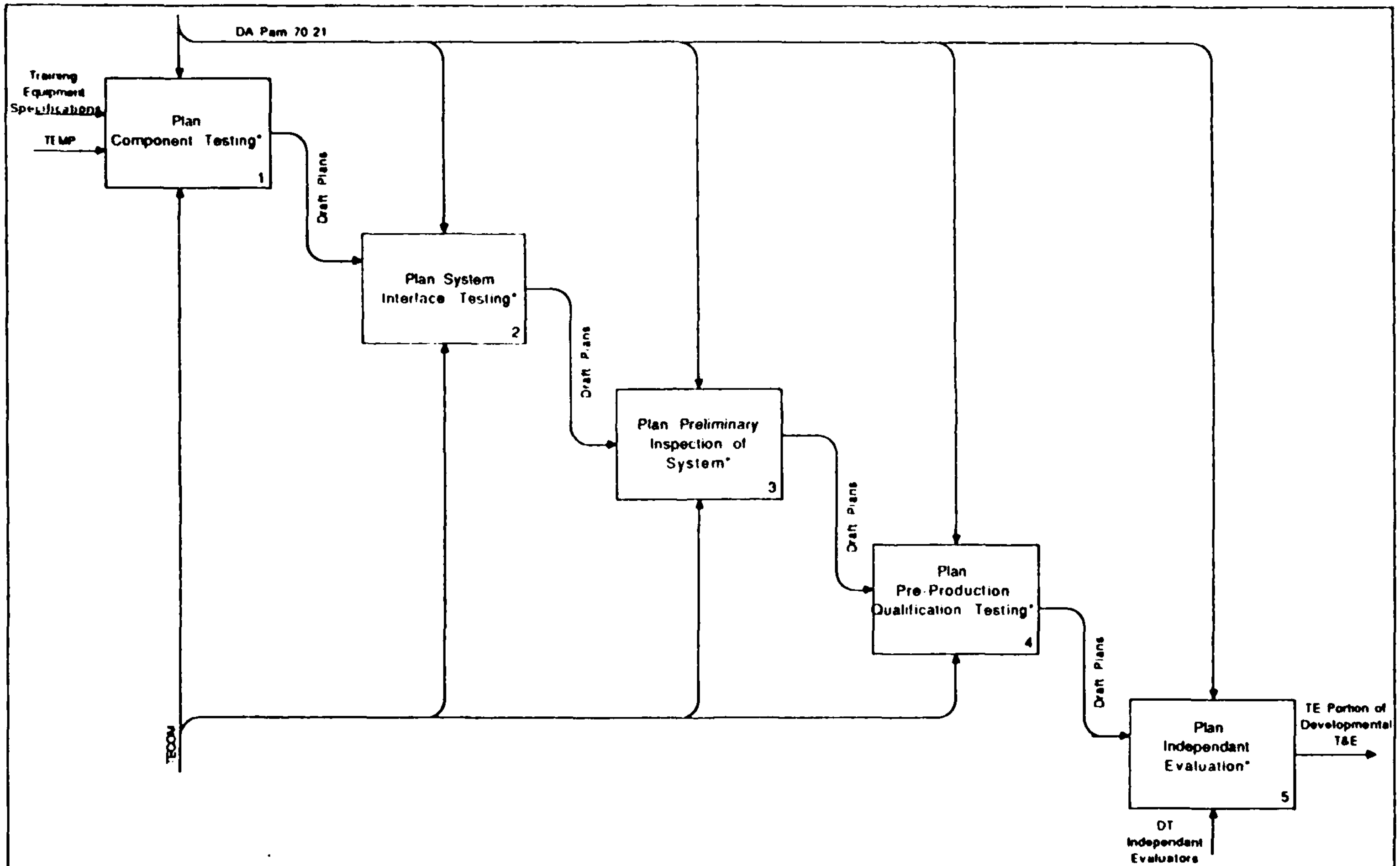


NODE:	TITLE:	NUMBER:
TRASER A031141	Conduct Developmental T&E of Training System Elements	

TRASER A031141 CONDUCT DEVELOPMENTAL T&E OF TRAINING SYSTEM ELEMENTS

The activities displayed in this diagram include the major phases in conducting developmental T&E programs on training equipment. These phases include (1) the preparation of a test plan, (2) the conduct of the test and generation of performance data, (3) the evaluation of these data, and (4) the reporting of the results. This developmental test and evaluation process is necessary to control the risk associated with training plans that incorporate new training equipment development. It is a way for determining if an equipment system or component will function as required, must be modified, a substitute found, or different approach used (i.e., will the visual system being developed for a simulator have the specified resolution required for target recognition practice).

USED AT: Winter Park	AUTHOR: Braby PROJECT: TRASER NOTES: 1 2 3 4 5 6 7 8 9 10	DATE: 1/8/90 REV: 1	WORKING DRAFT RECOMMENDED PUBLICATION	READER	DATE	CONTEXT: A031141

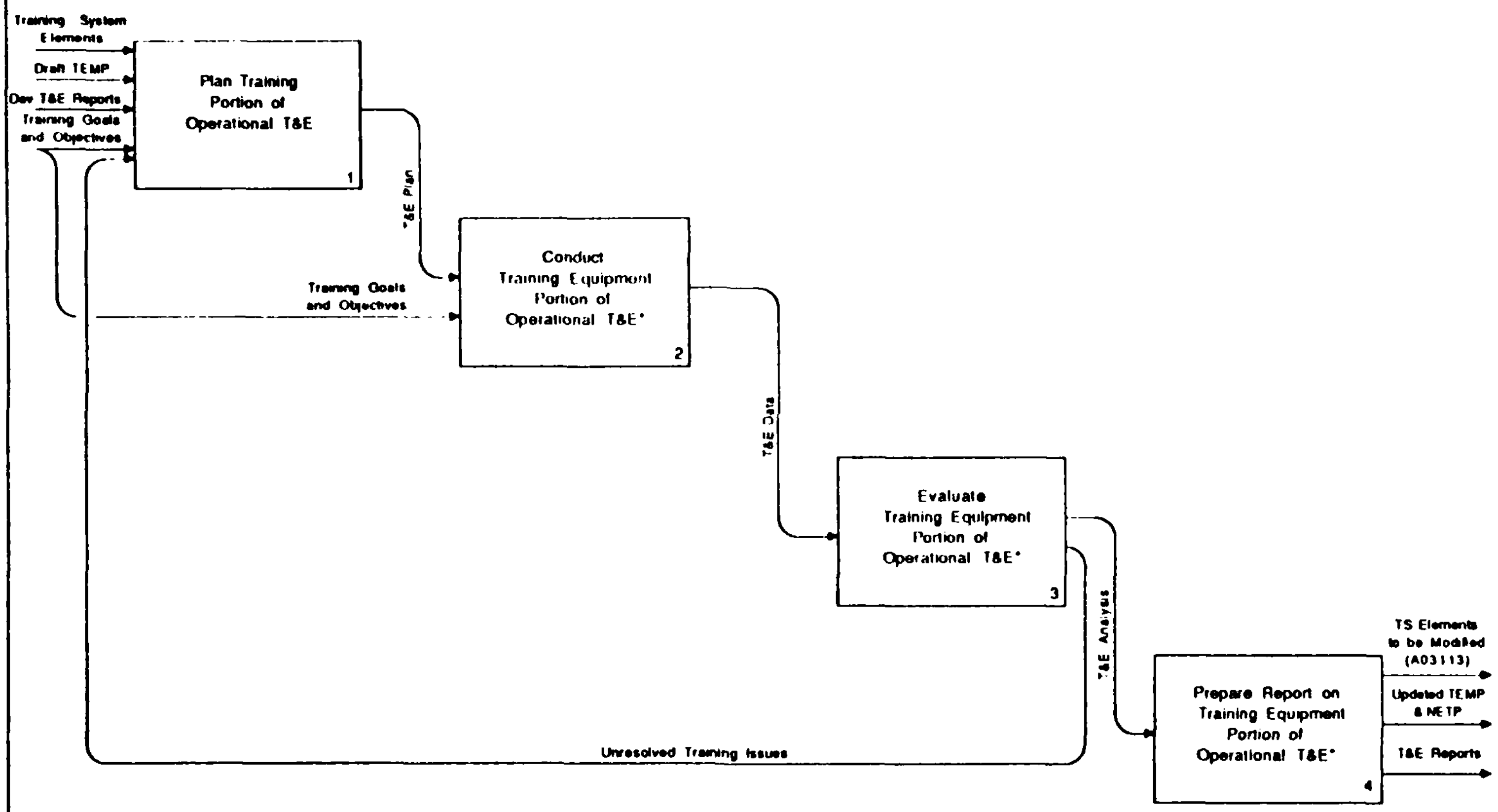


NODE: TRASER A0311411	TITLE: Plan Training Equipment Portion of Developmental T&E	NUMBER:

TRASER A0311411 PLAN TRAINING EQUIPMENT PORTION OF DEVELOPMENTAL T&E

This diagram displays the different types of testing that make up developmental tests. These types of tests are appropriate for the complex equipment that serve as training system elements. The tests would be conducted during the development of major simulators, and could be conducted on networked computerbased instructional systems and other training system elements of similar technical complexity. The different types of test plans include those for component testing, system interface testing, preliminary inspections of system, pre-production qualification testing and those for the independent evaluation. These plans are presented in the Training Evaluation section of the Developmental T&E Plan.

USED AT: Winter Park	AUTHOR: Braby PROJECT: TRASER NOTES: 1 2 3 4 5 6 7 8 9 10	DATE: 1/8/90 REV: 1	WORKING DRAFT RECOMMENDED PUBLICATION	READER	DATE	CONTEXT: A03114



NODE: TRASER A031142	TITLE: Conduct Operational T&E of NET and Integrated Training System Elements	NUMBER:

TRASER A031142 CONDUCT OPERATIONAL T&E OF NET AND INTEGRATED TRAINING SYSTEM ELEMENTS

This diagram divide the task of conducting operational T&Es into four separate functions. The following activities are undertaken given the Test and Evaluation Master Plan (TEMP), the training system elements for testing, reports on the developmental tests of these elements, and the training goals and objectives. First, a plan for the training portion of the operational T&E is prepared. Next, the T&E of training elements is conducted. This is followed by the evaluation of the data, which leads to the last task of preparing the report on these activities. The outcomes of these activities include an updated TEMP and NTEP, and a list of training system materials that require modification to meet standards.

USED AT:	AUTHOR: Braby	DATE: 1/8/90		WORKING	READER	DATE	CONTEXT:
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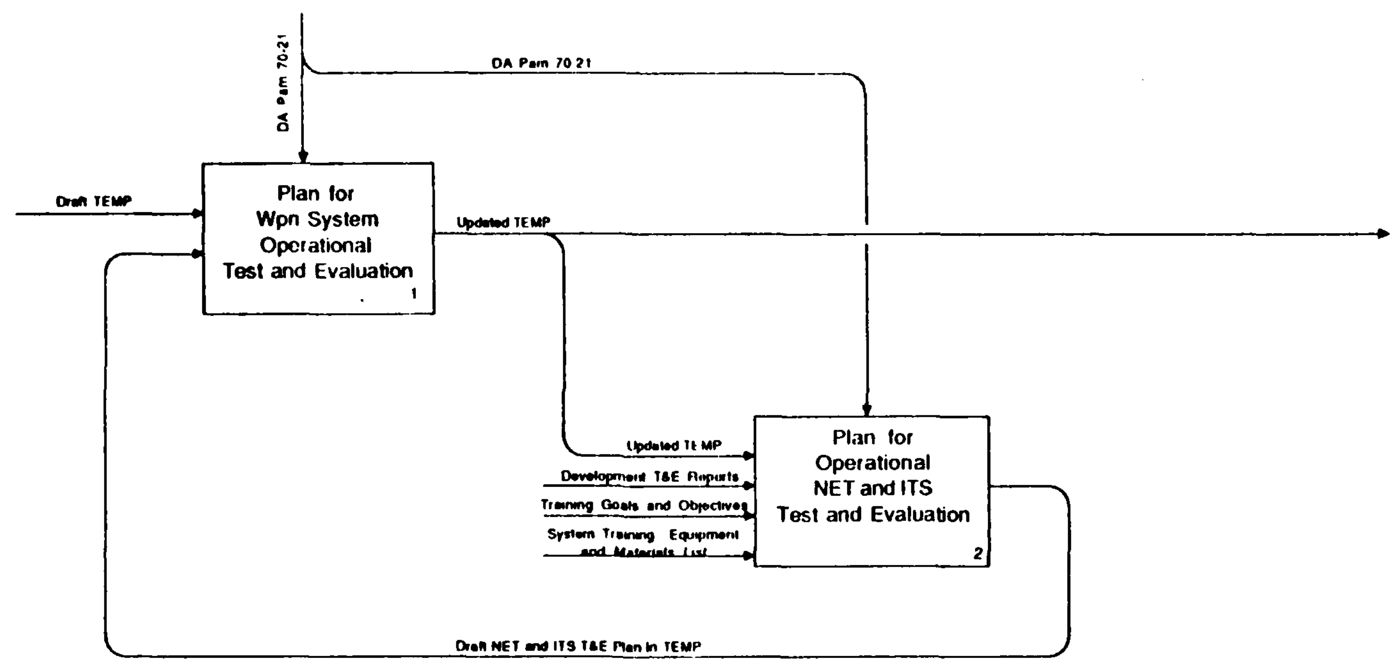

NODE:	TITLE:	NUMBER:
TRASER A0311421	Plan Training Portion of Operational T&E	

TRASER A0311421 PLAN TRAINING PORTION OF OPERATIONAL T&E

The purpose of this diagram is to make clear that the Operational training T&E is a part of the Weapon System Operational T&E. It emphasizes the training part of the overall Operational T&E, and provides for a more detailed discussion of the planning for this type of training oriented T&E in a subsequent diagram.

USED AT:	AUTHOR: Braby	DATE: 1/8/90		WORKING	READER	DATE	CONTEXT:
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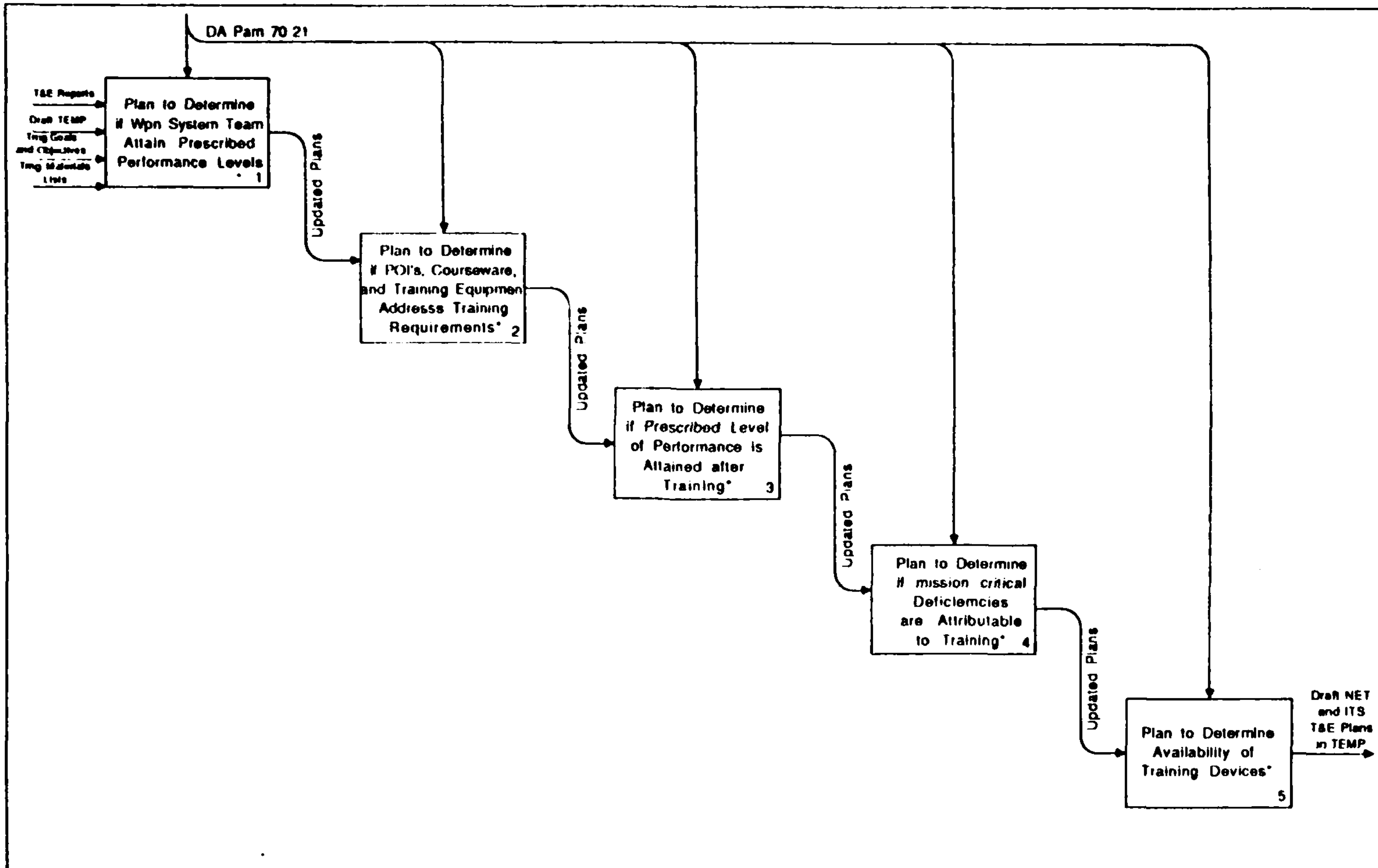

NODE:	TITLE:	NUMBER:
TRASER A03114212	Plan for Operational NET and ITS T&E	

TRASER A03114212 PLAN FOR OPERATIONAL NET AND ITS T&E

The activities depicted in this diagram are the planning functions for the various forms of operational T&E performed on the training system and its elements. Five separate forms of test and evaluation are planned. They are plans to determine (1) if the weapon system teams attain prescribed performance levels in the operation, maintenance or support of the weapon system, (2) if the training materials and equipment address the identified training requirements, (3) if each individual that is in a team achieves the prescribed level of knowledge and skill as a result of the training program, (4) if mission critical deficiencies are attributable to the quality or content of the training program, and (5) if training devices, such as simulators or part-task trainers, are at least as available as specified in the design requirements. The output of this planning effort is an expansion and update of the Test and Evaluation Master Plan (TEMP).

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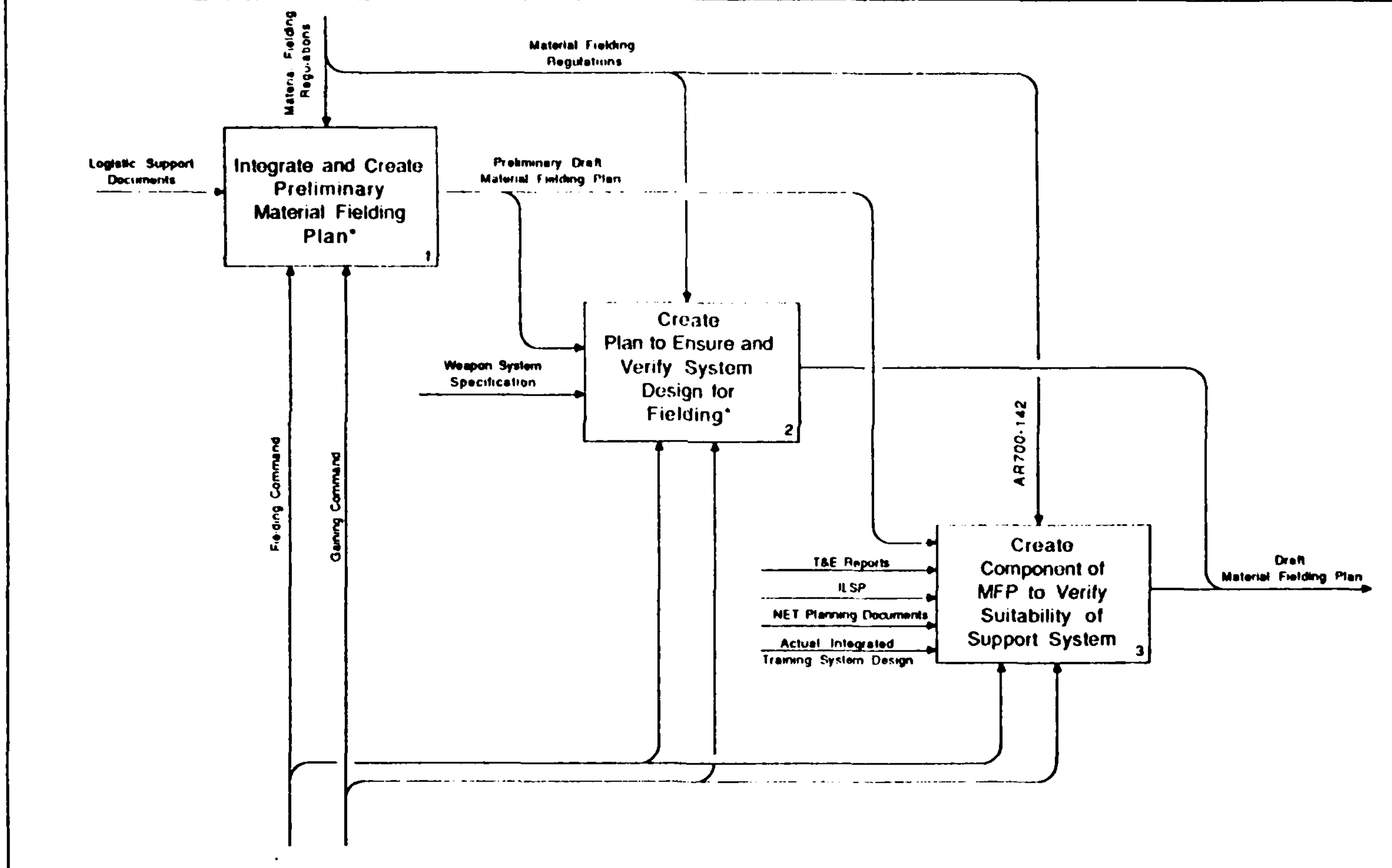

NODE:	TITLE:	NUMBER:
TRASER A03115	Prepare Material Fielding Plan	

TRASER A03115 PREPARE MATERIEL FIELDING PLAN

This diagram is a high level view of the process of preparing the Materiel Fielding Plan (MFP). After a preliminary MFP is created which blocks out the general content of the plan, the two major areas of the plan are further developed. The first is to ensure and verify that the system is designed for fielding. The second is to ensure and verify that the support system for the weapon system is designed and ready for fielding. Training is a component of this second area. This diagram isolates this area for closer inspection.

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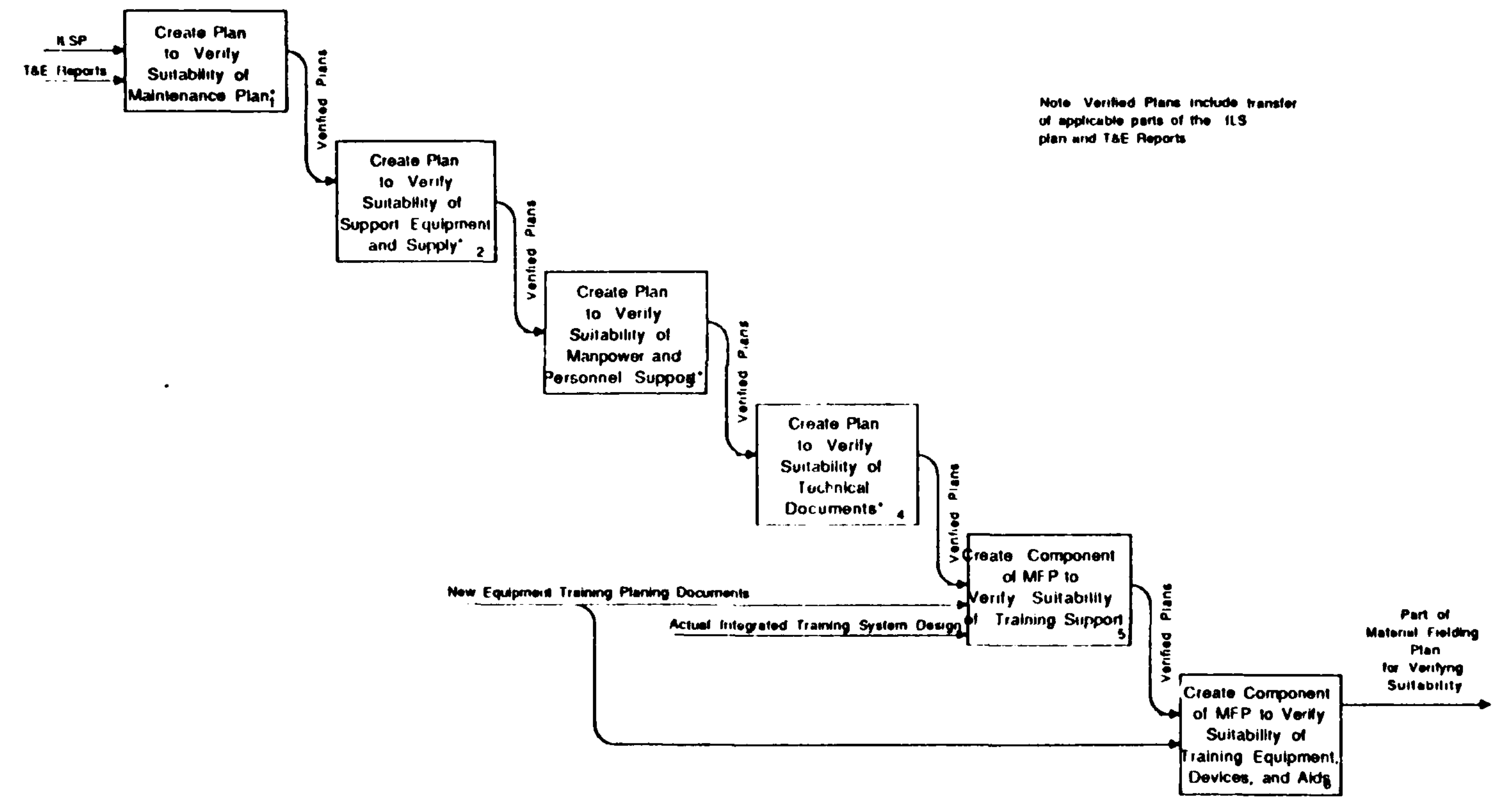

NODE:	TITLE:	NUMBER:
TRASER A031153	Create Component of MFP to Verify Suitability of Support System	

TRASER A031153 CREATE COMPONENT OF MATERIEL FIELDING PLAN TO VERIFY SUITABILITY OF SUPPORT SYSTEM

The activities associated with verifying the suitability of the support system include six major areas. All six impact the design of the training system, and two are directly focused on training. The first concern is to plan how to verify the suitability of the maintenance system. The issue is to determine if the maintenance support system can function in the field. The second concerns a plan to verify that the support equipment and supply systems will function as required. The third area is to develop procedures and measures with which to determine if the manpower and personnel planning has been adequate. Next, is the task of planning how to determine if the technical manuals and other documents for the operation, maintenance, and support of the new weapon system are adequate and properly distributed to support the new weapon system. The first of the planning activities that directly concerns training is the effort to plan to verify the suitability of training support, i.e., the suitability of the training courses, training teams and the training handbooks and other materials. The last activity is the related effort to determine how to verify the suitability of the training equipment, devices and aids used in this training. Together, these components of the Materiel Fielding Plan are used to ensure that the weapon support system is adequate for sustained use of the new weapon system.

USED AT:	AUTHOR: Braby	DATE: 1/8/90	WORKING	READER	DATE	CONTEXT:
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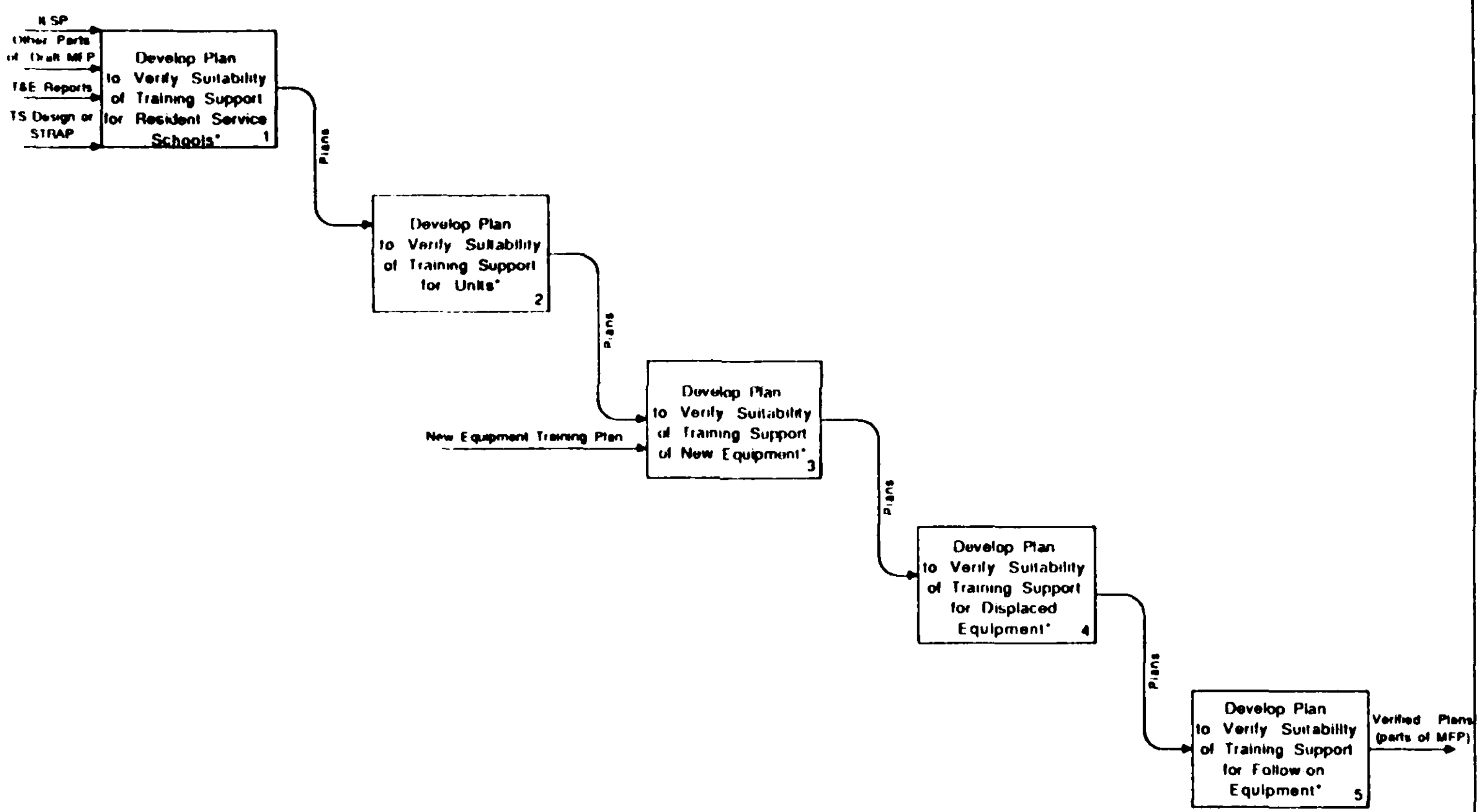

NODE:	TITLE:	NUMBER:
TRASER A0311535	Create Materiel Fielding Plan Requirements to Verify Suitability of Training Support	

TRASER A0311535 CREATE MATERIEL FIELDING PLAN REQUIREMENTS TO VERIFY SUITABILITY OF TRAINING SUPPORT

The activities in this diagram will create a plan for measuring the suitability of the training program for the new weapon system. When the plan is implemented, deficiencies in the training system design will be identified for the purpose of correcting these deficiencies. The plan to determine suitability of training support looks at the suitability of training support for resident service schools, units, new equipment, displaced equipment, and follow-on equipment. It looks broadly at training needs and the services and materials provided to meet these needs. It focuses on the users perspective of the adequacy of training support.

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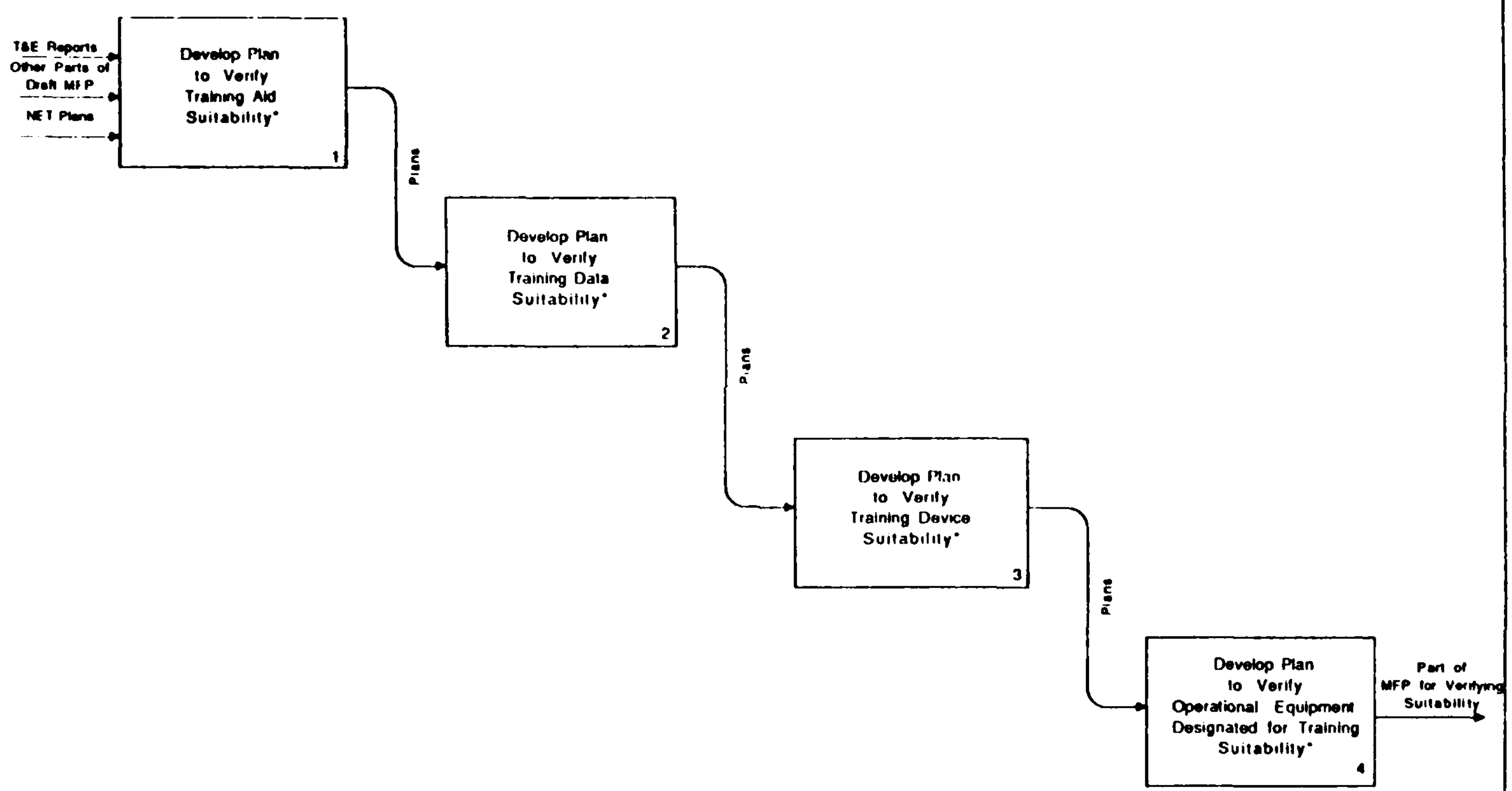

NODE:	TITLE:	NUMBER:
TRASER A0311536	Create Component of Materiel Fielding Plan to Verify Suitability of Training Equipment, Devices, and Aids	

TRASER A0311536 CREATE COMPONENT OF MATERIEL FIELDING PLAN TO VERIFY SUITABILITY OF TRAINING EQUIPMENT, DEVICES, AND AIDS

As an extension to IDEFo A0311535, the activities in this diagram seek to determine if the various types of training equipment are suited to the tasks assigned them in the training system design. In order to create procedures to verify suitability, the larger task is divided into a set of separate tasks. These tasks are to plan the procedures for verifying the suitability of the training aids, the training data to be collected, the training devices, and the operational equipment for the specific training exercises in the training plan. As in other parts of the Materiel Fielding Plan, the focus is on the users perspective of the adequacy of training support provided by these specific training system elements.

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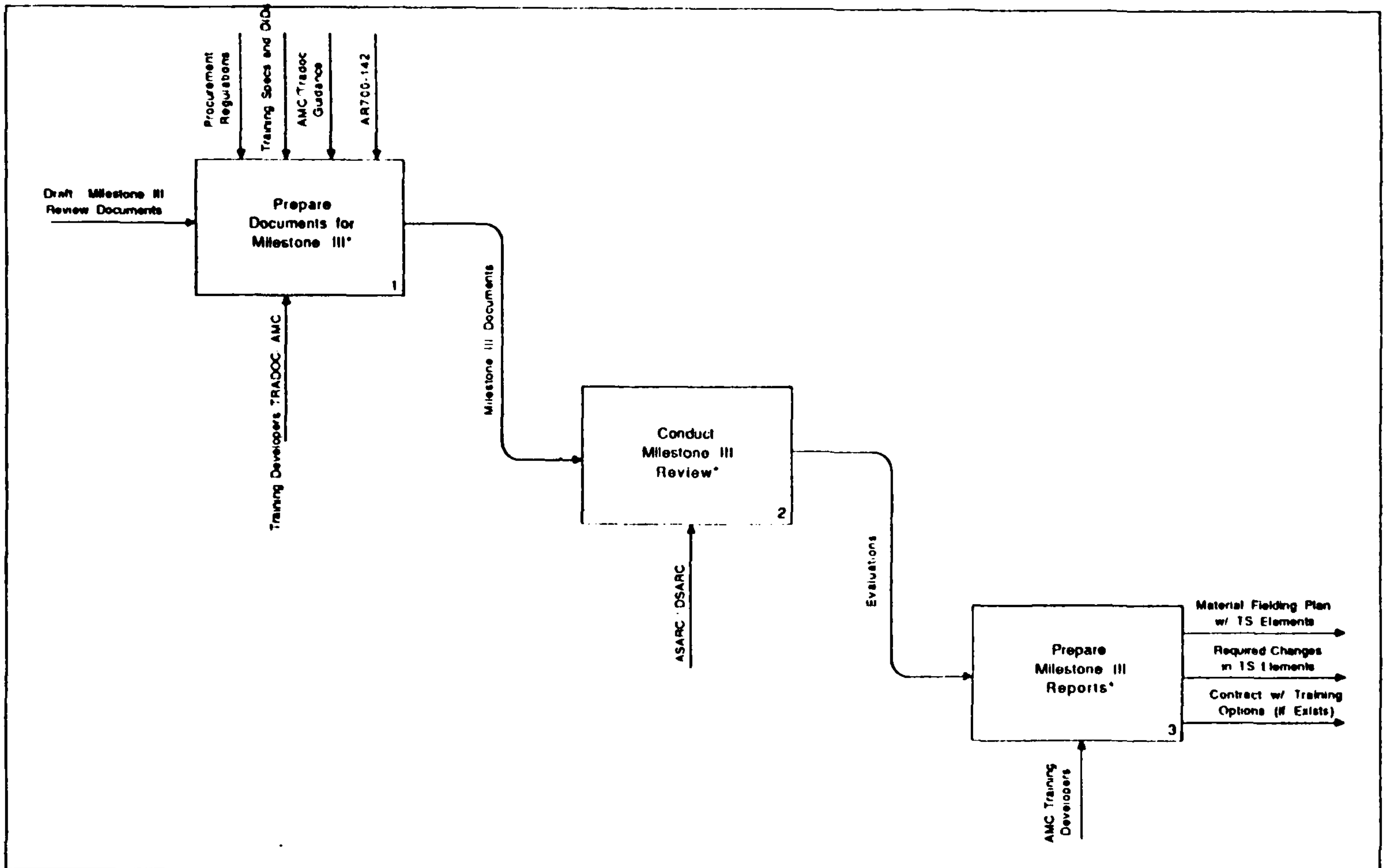

NODE:	TITLE:	NUMBER:
TRASER A0312	Achieve Milestone III Decision	

TRASER A0312 ACHIEVE MILESTONE III DECISION

The Milestone III decision is that the Full Scale Development phase has been successfully completed, and that the weapon system should be produced. The A0312 diagram breaks this decision process into three major events, preparing the documents for the Milestone III review, the actual review, and the preparation of the reports from the review. While the review is focused on the weapon system, the plans for training support of the weapon system are a part of the review. All the training system design decisions that have been made up to this moment become the approved plan at this time. Final decisions between competing designs, including training system designs, can be made at this time as system performance, requirements, and resources are reviewed. The major documents that have defined the training system design are revised and updated prior to the Milestone III review. Included are the Operational and Organizational (O&O) Plan, the Integrated Logistic Support Plan (ILSP), the System Training Plan (STRAP), and the Test and Evaluation Master Plan (TEMP). The Developmental and Operational Test results are reviewed, and the Final Qualitative and Quantitative Personnel Requirements Information (FQQPRI) and Final Basis of Issue Plan (FBOIP) are prepared. Also the Type Classification (TC) documentation and the initial Materiel Fielding Plan (MFP) have been prepared.

USED AT:	AUTHOR: Braby	DATE: 1/8/90		WORKING	READER	DATE	CONTEXT:
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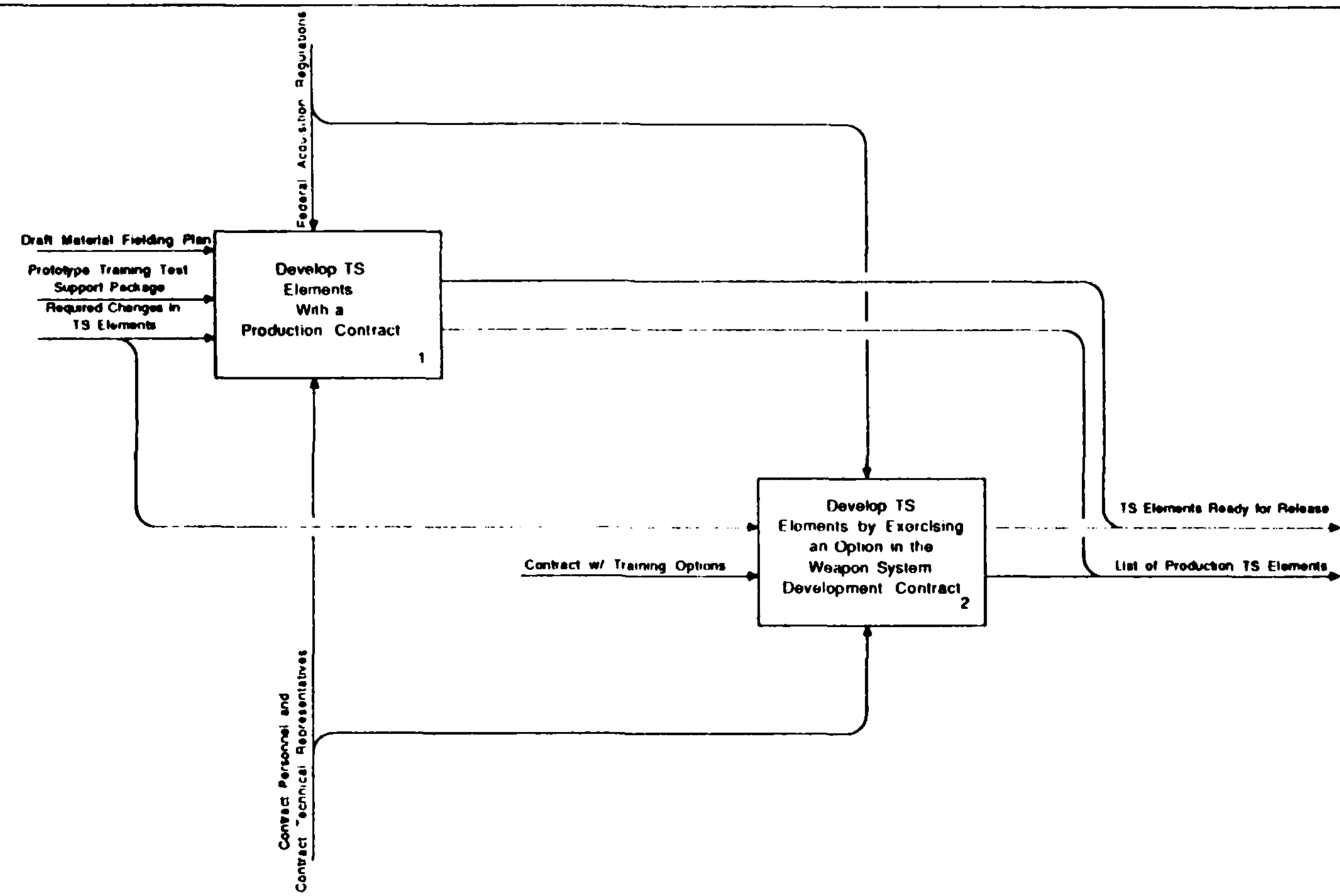

NODE:	TITLE:	NUMBER:
TRASER A0313	Develop Training System Elements During the Production and Deployment Phase	

TRASER A0313 DEVELOP TRAINING SYSTEM ELEMENTS DURING THE PRODUCTION AND DEPLOYMENT PHASE

The activities in this diagram account for the two major options being used to produce training system elements during the production phase of weapon system development. It corresponds to the ways that the production version of the weapon systems are produced. In some instances, a special production contract is issued, and in other instances an option in the weapon system development contract is activated. It is in these contracts that the actual training system design elements are made into actual products and services. The choice to include these activities in the set of diagrams depicting training system design decisions is based on the observation that even in the production phase of the project, decisions impacting the training system design are made. Only when the training products are successfully delivered will the exact components of the Actual Training System Design be known.

USED AT:	AUTHOR: Braby	DATE: 1/8/90		WORKING	READER	DATE	CONTEXT:
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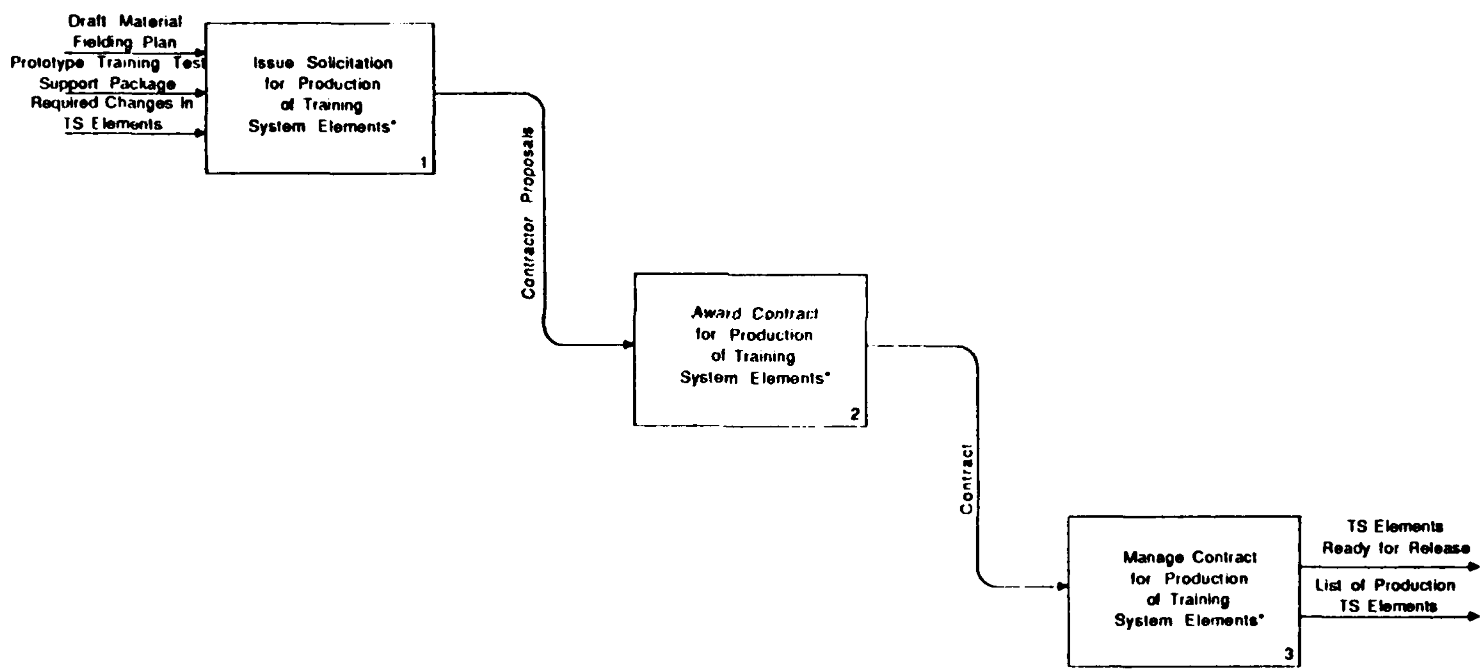

NODE: TRASER A03131

TITLE: Develop Training System Elements with a Production Contract

NUMBER:

TRASER A03131 DEVELOP TRAINING SYSTEM ELEMENTS WITH A PRODUCTION CONTRACT

If a new contract for production of the weapon system is required, then the complete contracting process is required. This includes preparing and issuing a solicitation package, followed by the evaluation of proposals, and the award of a contract including the production quantities of the weapon system and the supporting training system. This is followed by monitoring contractor performance and then the acceptance of the products of the contract. The actual training system elements developed in this manner may not correspond exactly to the expectations of the training system planners in that a contractor other than the one for full scale development may win the contract award. The products of the new contract will be influenced by changing contingencies and the professional judgements and style of those developing the training packages. In order to maintain a current description of the training system design, the list of production training system elements must be used to update the earlier version so as to represent what is actually produced under the PM managed production contract.

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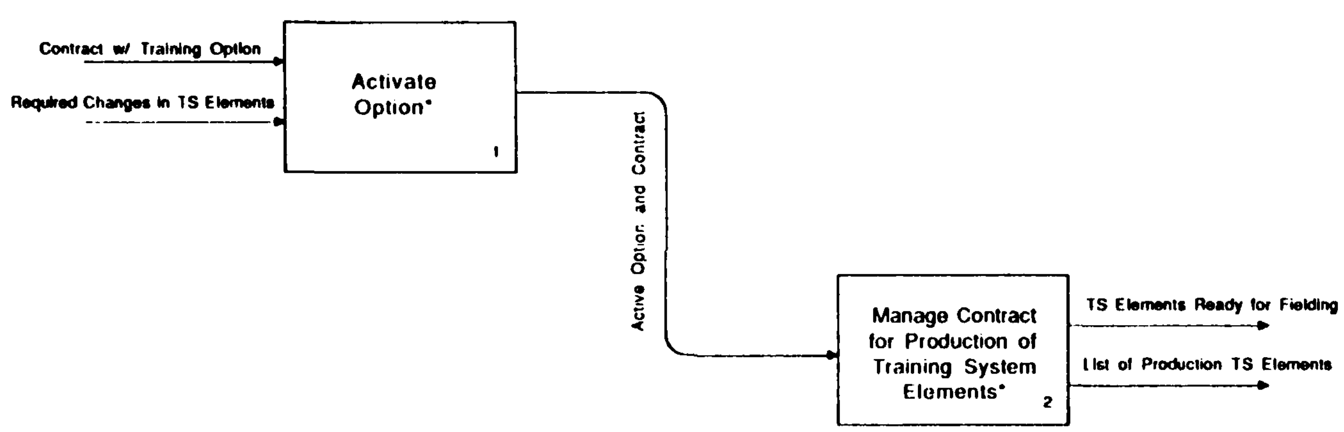
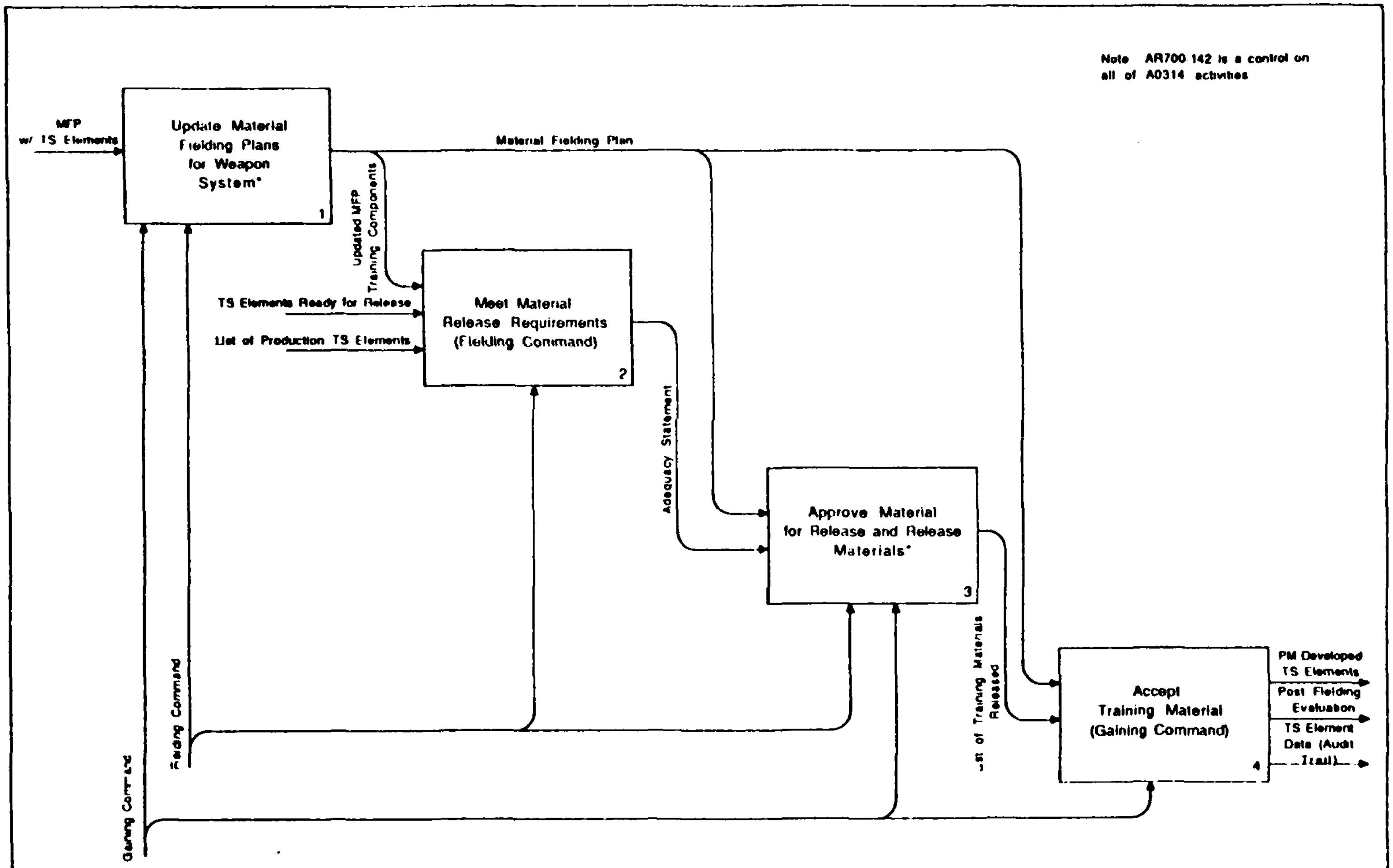


NODE:	TITLE:	NUMBER:
TRASER A03132	Develop Training System Elements by Exercising an Option in the Weapon System Development Contract	

TRASER A03132 DEVELOP TRAINING SYSTEM ELEMENTS BY EXERCISING AN OPTION IN THE WEAPON SYSTEM DEVELOPMENT CONTRACT

The original full scale development weapon system contract, including the requirements for the development of the training system elements, may have contained an option for the production of the required number of weapon systems. If this option exists and is activated, the production of the training system design elements is a simpler process. The actual production effort would be carried out by the same organization that developed the prototype, following the specifications and responding to the lessons learned during the full scale development of the training system, including the operational testing of that training system.

USED AT: Winter Park	AUTHOR: Braby DATE: 1/8/90 PROJECT: TRASER REV: 1 NOTES: 1 2 3 4 5 6 7 8 9 10		WORKING DRAFT RECOMMENDED PUBLICATION	READER DATE	CONTEXT: A031



NODE: TRASER A0314

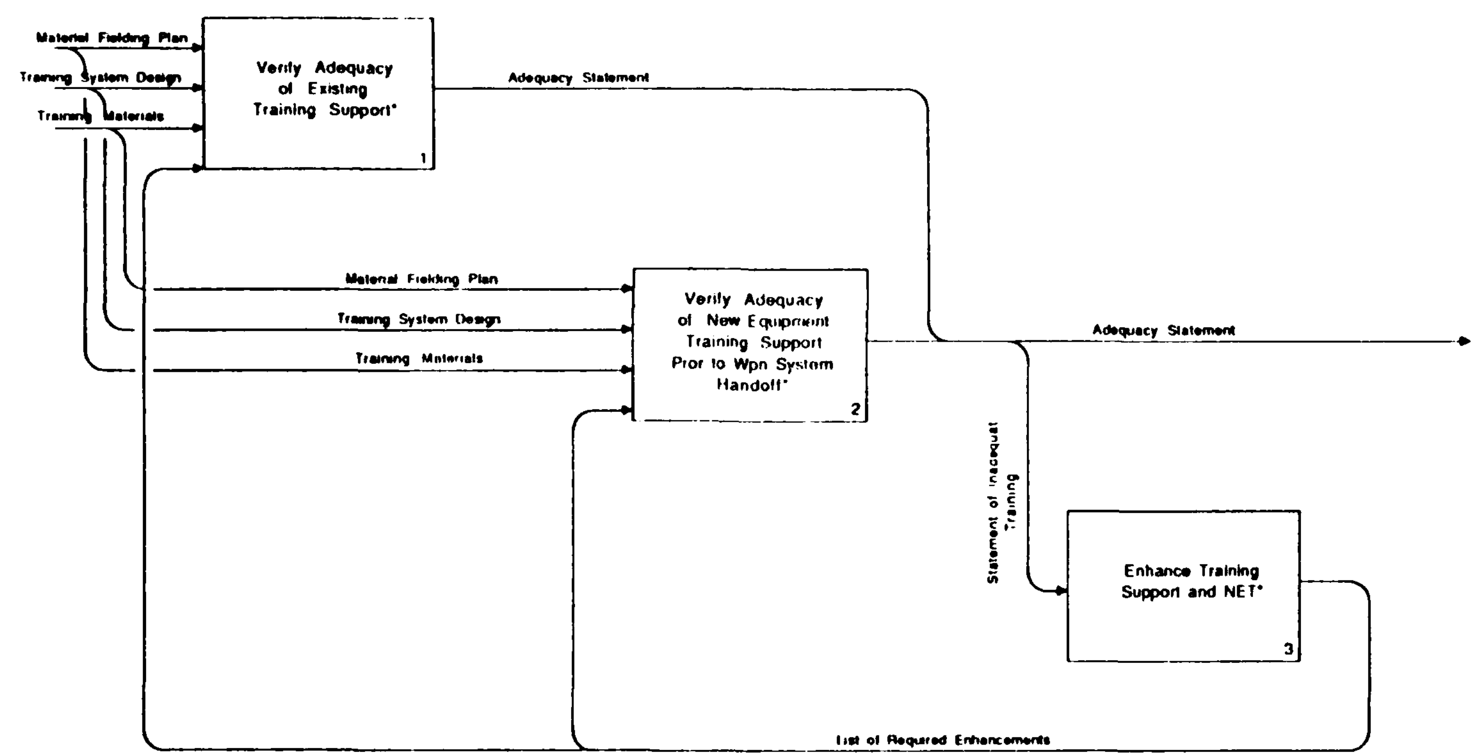
TITLE: Release Approved Training Materials

NUMBER:

TRASER A0314 RELEASE APPROVED TRAINING MATERIALS

The activities in the diagram are governed by AR 700-142, Materiel Release, Fielding and Transfer. The purpose of these activities are to ensure that both the Fielding Command and the Gaining Command have completed the necessary work to ensure that the units receiving the weapon systems will be able to operate, maintain, support and employ the weapon systems. While this is a complex process, at the highest level it has four major operations. First, is to review the Materiel Fielding Plan and update the plan if necessary to reflect the reality of requirements and available resources at this point in time. Next, the Fielding Command reviews the status and condition of the resources require in the current Materiel Fielding Plan. The Fielding Command attempts to meet the obligations of that plan, and releases the materiel to the Gaining Command. Then, the Gaining Command inspects the materiel according to the Materiel Fielding Plan, and if appropriate, accepts the materiel. While this is a general statement for all components of the weapon system and its support, it is the process for the transfer of the training components, and accepting the supporting training.

USED AT: Winter Park	AUTHOR: Braby PROJECT: TRASER NOTES: 1 2 3 4 5 6 7 8 9 10	DATE: 1/8/90 REV: 1		WORKING DRAFT RECOMMENDED PUBLICATION	READER	DATE	CONTEXT: A0314



NODE: TRASER A03142	TITLE: Meet Material Release Requirements (Fielding Command)	NUMBER:

TRASER A03142 MEET MATERIEL RELEASE TRAINING REQUIREMENTS (FIELDING COMMAND)

The activities depicted in this diagram are that the Fielding Command (combat developer) reviews training support materials and services prepared to support the fielding of the weapon system, and if appropriate issues a statement to the effect that training preparation is as specified. The statement should also indicate that planned new equipment training to be provided prior to or concurrent with system handoff will take place and will be adequate. If the training support materials and services are not ready or do not meet the training design, then steps are taken to correct the situation. Since this review has been previously conducted at intervals, large discrepancies should not exist at this time.

USED AT:	AUTHOR: Braby	DATE: 1/8/90		WORKING	READER	DATE	CONTEXT:
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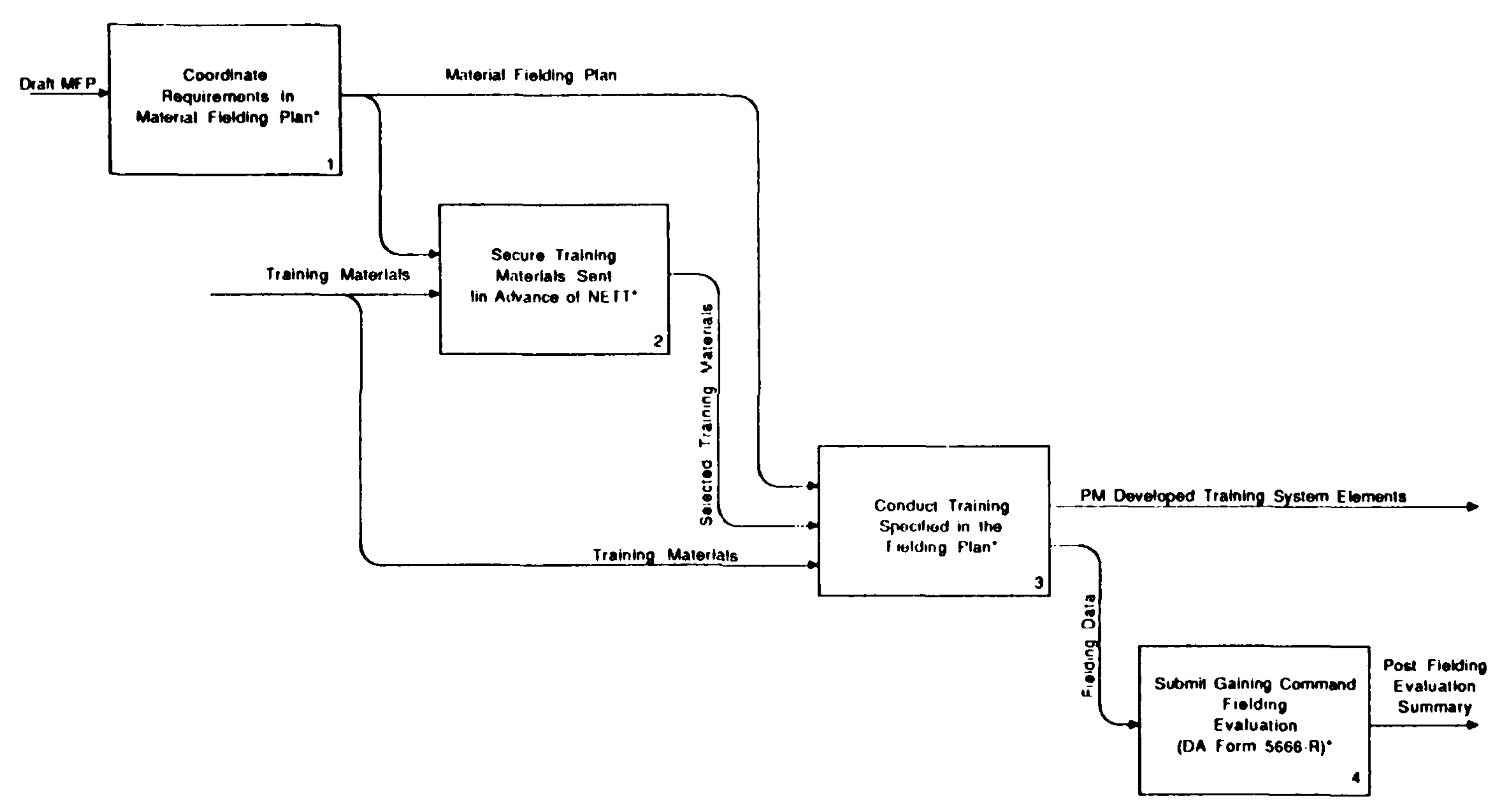
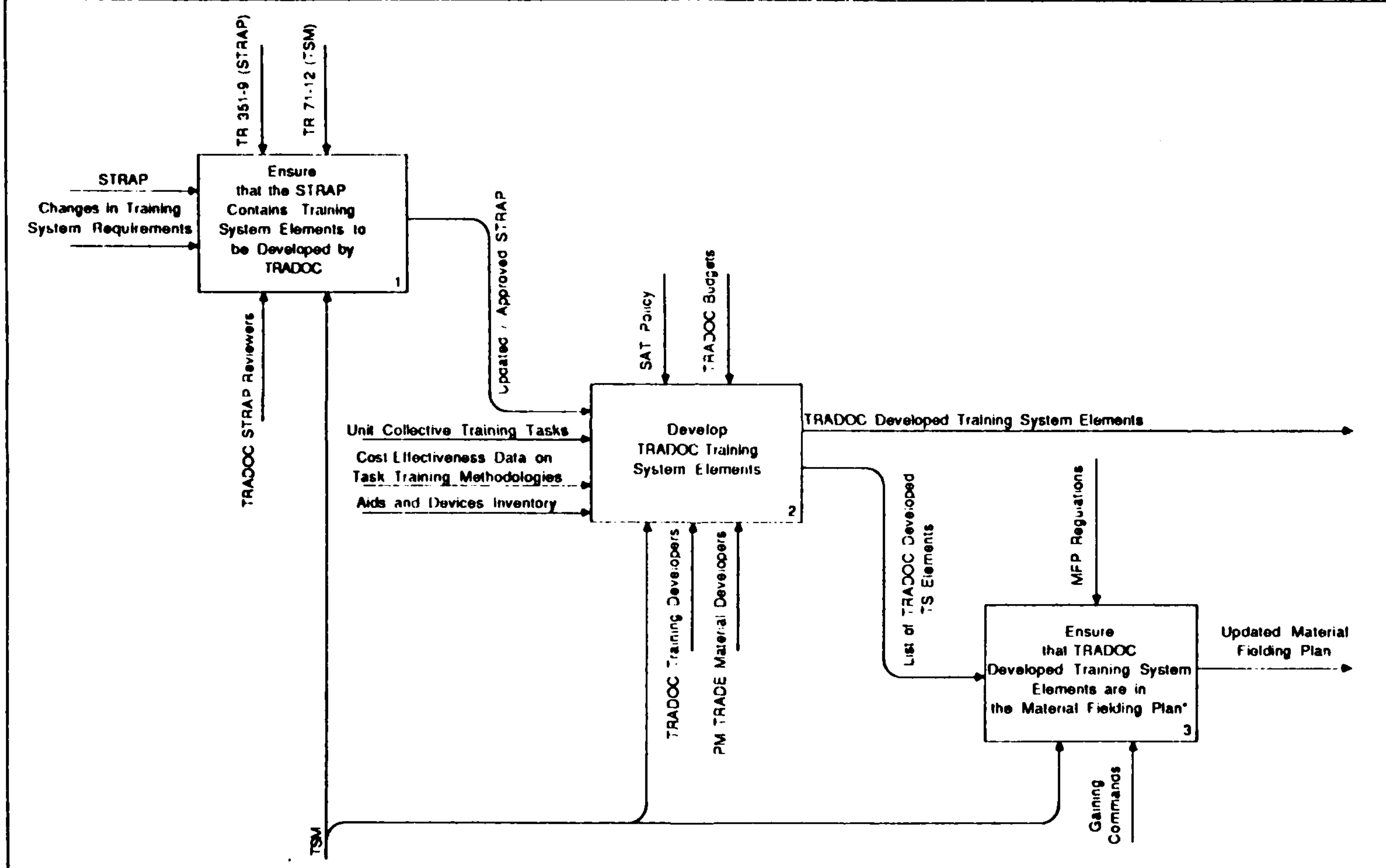


NODE:	TITLE:	NUMBER:
TRASER A03144	Accept Training Materials (Gaining Command)	

TRASER A03144 ACCEPT TRAINING MATERIALS (GAINING COMMAND)

This diagram describe the activities of the Gaining Command in accepting the training material and services. It includes a final review of the Material Fielding Plan to ensure that the plan is still appropriate as it relates to training. The diagram notes that in advance of implementing the Materiel Fielding Plan, materials are forwarded to the Gaining Command for storage so that they will be available when needed. At the appropriate moment in the fielding process the various training programs are conducted, and the other training resources are accepted by the Gaining Command. A Post Fielding Evaluation Summary is issued by the Gaining Command. Descriptive and performance data on the actual training system design implemented at the time of weapon system fielding is used to create a record for audit trail purposes and to create a version of the Training System Design which documents the training system as it actually exists. This version will be updated as changes are made during the life-cycle of the weapon system.

USED AT: Winter Park	AUTHOR: Braby PROJECT: TRASER NOTES: 1 2 3 4 5 6 7 8 9 10	DATE: 1/10/90 REV: 1	WORKING DRAFT RECOMMENDED PUBLICATION	READER	DATE	CONTEXT: A03

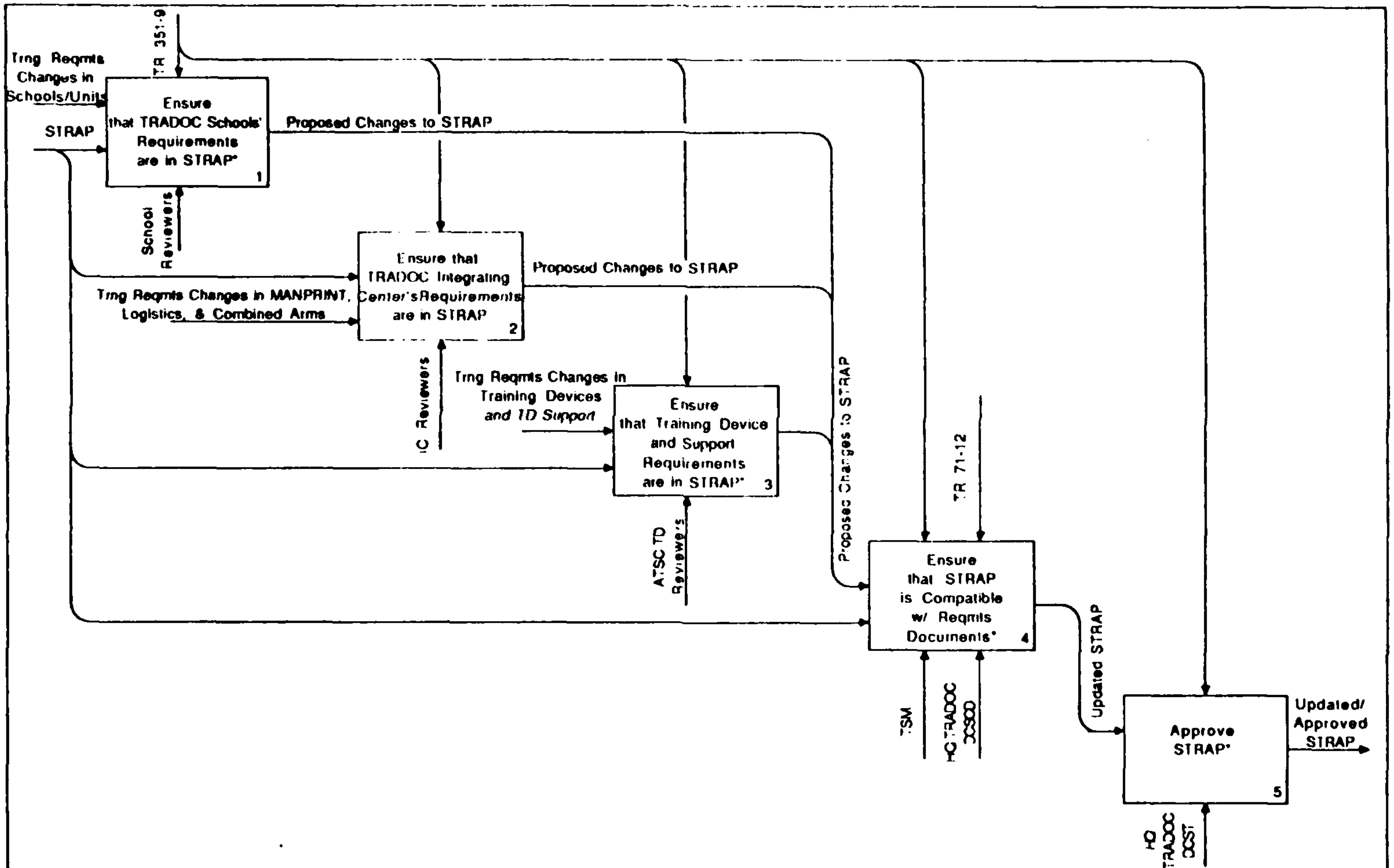


NODE: TRASER A032	TITLE: Develop Training System Elements Within TRADOC Managed Programs	NUMBER:

TRASER A032 *DEVELOP TRAINING SYSTEM ELEMENTS WITHIN TRADOC MANAGED* PROGRAMS

The activities depicted in this diagram concern the TRADOC effort to develop assigned training system elements. These elements are to be produced by the various organizations within the extended TRADOC command. This includes elements that are the responsibility of the Army Training Support Center, and elements that are developed by the proponent school. Recent weapon system development contracts have shifted much of the training system design and development to the PM contract for weapon system development, diminishing the TRADOC role in developing weapon system training materials. However this practice is not uniform across all weapon system procurements. TRADOC development of the training system elements is carried out concurrently with the weapon system production contract in preparation for conducting training at Initial Operational Capability (IOC). Starting with the Baseline Training System Design as expressed in the STRAP, the list of training system design elements planned to be developed by the PM, and individual and collective tasks provided by ASAT, the high level activities depicted in this diagram create all the other components of the weapon's training system created by TRADOC. As a part of producing these training system elements, data on these elements is used to update the list of training system design elements incorporated in the training system design. Together, these PM and TRADOC elements make up the total set of training supports required by soldiers to meet standards for the operation, maintenance, support and tactical employment of the weapon system. This information on the TRADOC developed training system elements is incorporated into the Materiel Fielding Plan as this plan is expanded and updated.

USED AT: Winter Park	AUTHOR: Braby DATE: 1/10/90 PROJECT: TRASER REV: 1 NOTES: 1 2 3 4 5 6 7 8 9 10	WORKING DRAFT RECOMMENDED PUBLICATION	READER	DATE	CONTEXT: A032



NODE: TRASER A0321	TITLE: Ensure that the STRAP Contains TS Elements to be Developed by TRADOC	NUMBER:

TRASER A0321 ENSURE THAT THE STRAP CONTAINS THOSE TRAINING SYSTEM ELEMENTS TO BE DEVELOPED BY TRADOC

The STRAP is reviewed periodically by the various training developers and those representing the gaining commands. Details in the STRAP evolve during weapon system full scale development. Reviews by those representing the school and unit training, MANPRINT, logistics and combined arms training, and those concerned with the design and use of major non-system training devices, provide the various proposed changes to the STRAP to ensure that it describes the full set of requirements. This diagram focuses on the area of requirements supported by TRADOC, i.,e., requirements beyond those being directly supported by the PM and weapon system development contract. The updated version of the STRAP, when approved, should contain the full range of training system design elements, Consisting of those the PM is providing and the elements being provided by TRADOC.

USED AT:	AUTHOR: Braby	DATE: 1/10/90		WORKING	READER	DATE	CONTEXT:
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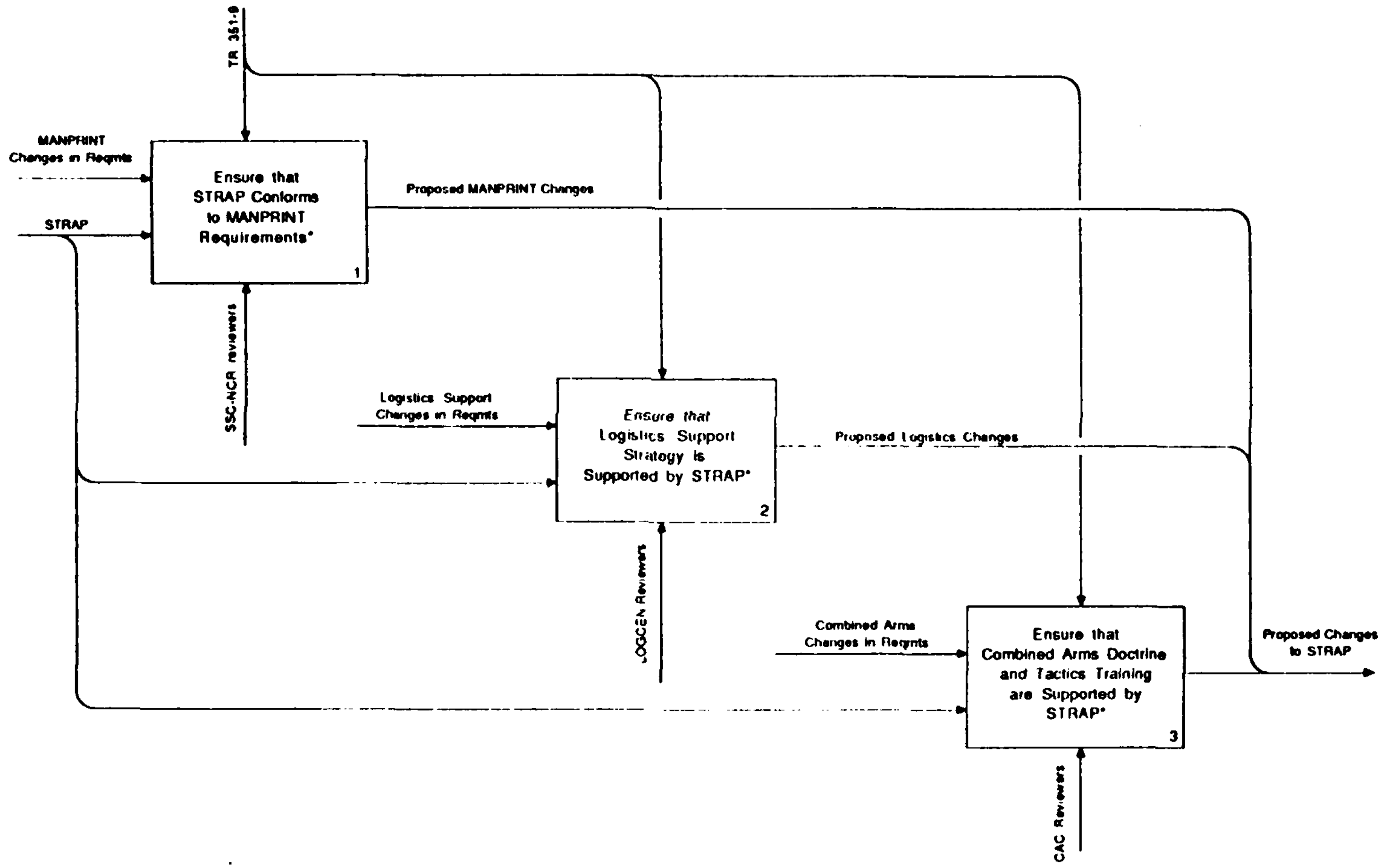

NODE:	TITLE:	NUMBER:
TRASER A03212	Ensure that TRADOC Integrating Center's Requirements are in STRAP	

TRASER A03212 ENSURE THAT TRADOC INTEGRATION CENTER'S REQUIREMENTS ARE IN STRAP

The activities in this diagram are the expanded description of the Integration Centers' review of the draft STRAP during full scale development to ensure their requirements are included in the training system design. It shows how the Soldier Support Center, National Capital Region ensures that the STRAP conforms to MANPRINT requirements. It shows how the Logistics Center ensures that the STRAP supports the logistics requirements. And it shows how the Combined Arms Center ensures that the STRAP supports combined arms doctrine and tactics training. Proposed changes by Integration Centers are later merged with other proposed changes and incorporated as appropriate into the STRAP by the TSM and TRADOC DCSCD, for approval by HQ TRADOC DCST.

USED AT:	AUTHOR: Braby	DATE: 1/10/90		WORKING	READER	DATE	CONTEXT:
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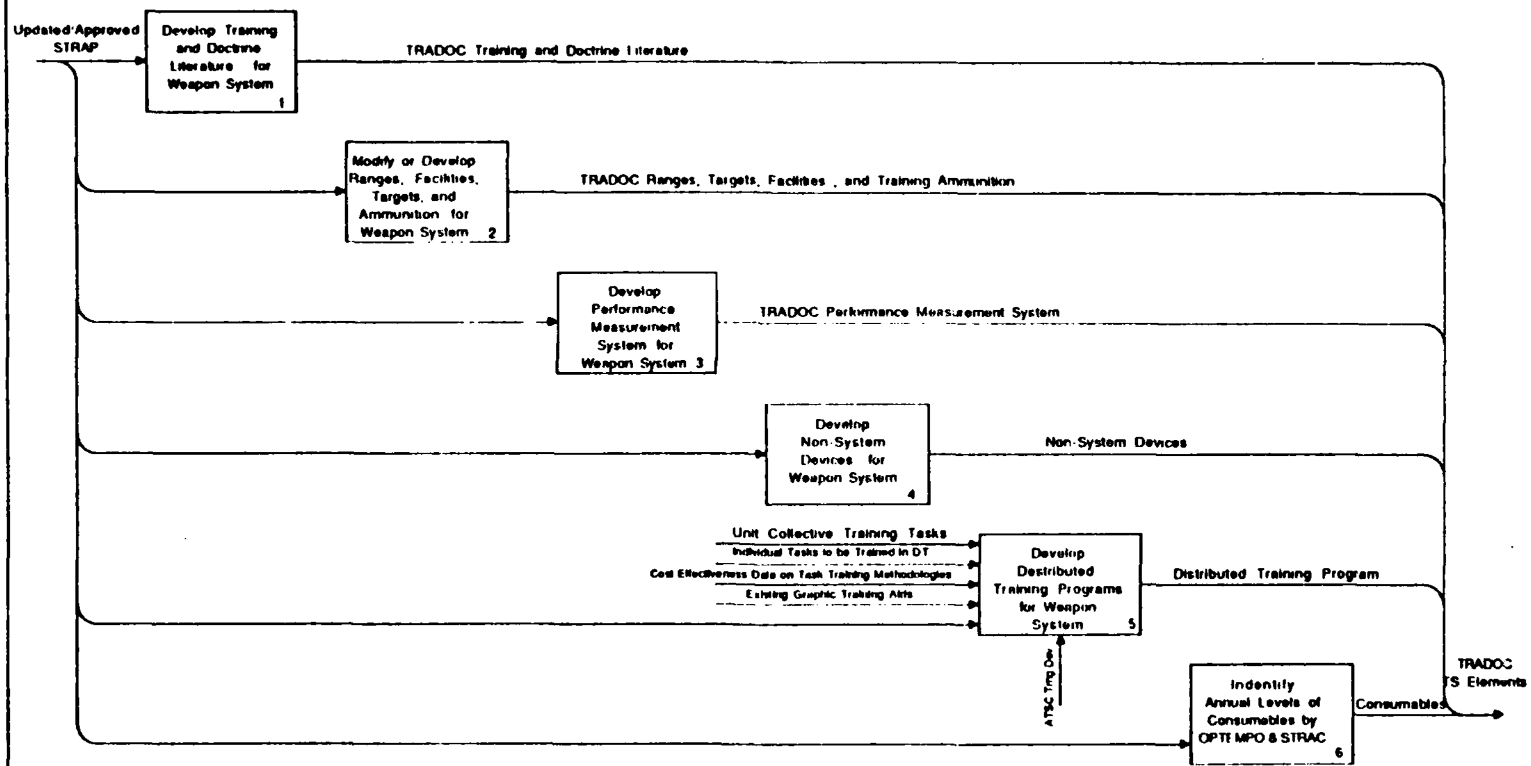

NODE: TRASER A0322	TITLE: Develop TRADOC Training System Elements	NUMBER:

TRASER A0322 DEVELOP TRAINING SYSTEM ELEMENTS WITHIN TRADOC MANAGED PROGRAMS

The operations described in this diagram include the major areas of direct TRADOC development of training system elements. The extent of direct TRADOC development and funding varies among weapon systems. Recent weapon system developments have tended to include a broader range of training system design elements in the PM weapon system development contract than previously. Typical training system design elements that are candidates for TRADOC development include (1) training literature and course documents for instruction on the tactical deployment of the weapon system, (2) modifying or developing various types of facilities for use in weapon system training, such as ranges, target systems, and the design of related consummables such as training unique ammunition and targets, (3) school and unit performance measurement systems, (4) non-system devices that support training on the weapon system, such as networked simulators like SIMNET, and tactical engagement simulations such as MILES, (5) distributed training programs and materials, such as teleconferencing materials and equipment and interactive courseware, and (6) annual standards for the consummables necessary to meet and maintain readiness requirements (OPTEMPO and STRAC standards). Not only must these training system design elements be defined early in the training system design process, and be included in the trade-off studies during concept formulation, they must be systematically developed during full scale development and tested during operational test and evaluation. As increasing emphasis is placed on new ways to use distributed training, the early development of these types of training support materials becomes critical. These new distributed training approaches must be subjected to careful operational test and evaluation. The output described in this diagram, training system elements developed by TRADOC, is merged with the training system elements developed by the PM and together as an operating training system they are subjected to a formal Operational Test and Evaluation Program.

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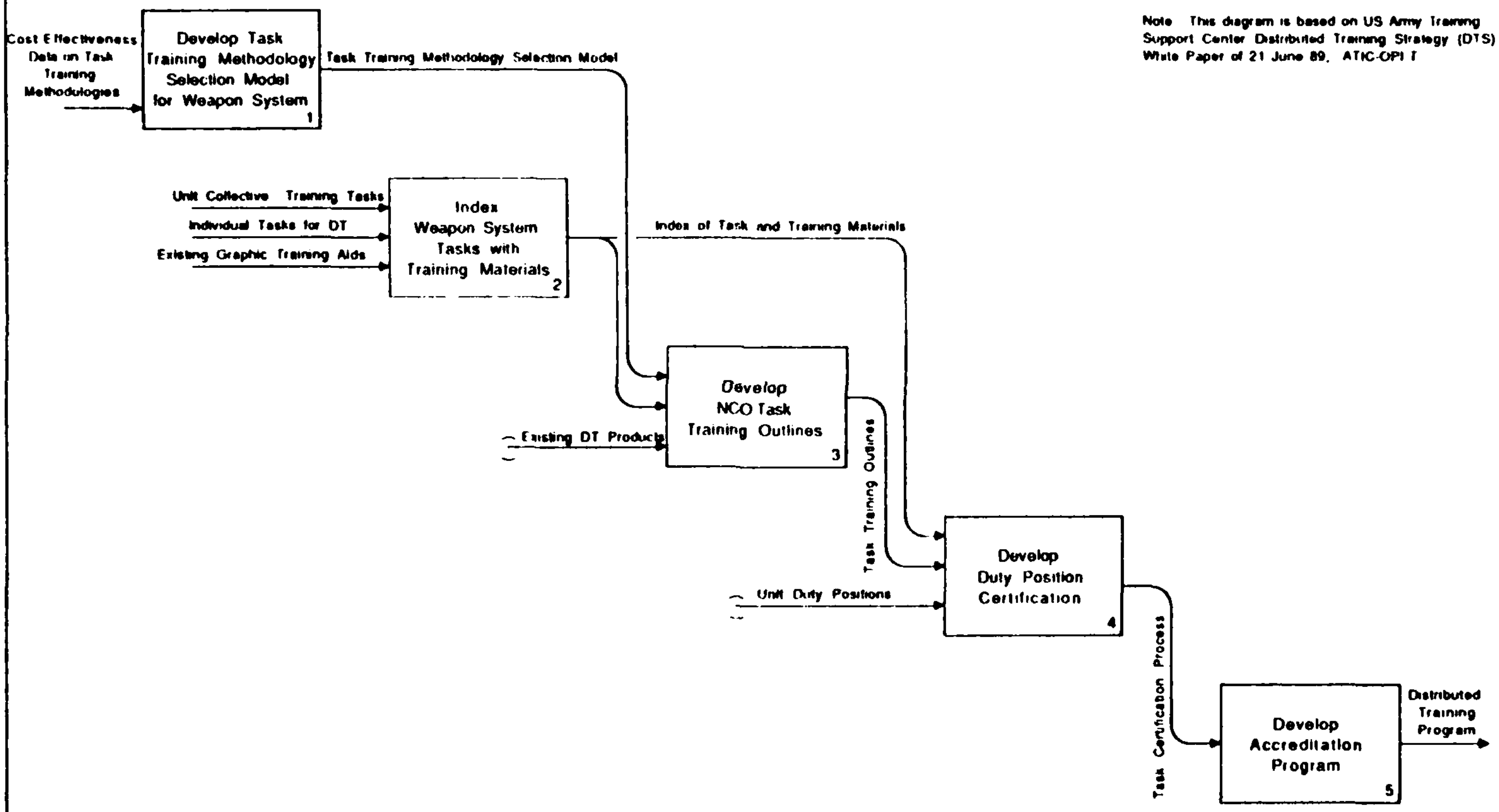
Note This diagram is based on US Army Training Support Center Distributed Training Strategy (DTS) White Paper of 21 June 89, ATIC-OPI T



NODE:	TITLE:	NUMBER:
TRASER A03225	Develop Destributed Training Programs for Weapon System	

TRASER A03225 DEVELOP DISTRIBUTED TRAINING PROGRAM FOR WEAPON SYSTEM

There is new emphasis on the use of distributed training techniques in the Army. This diagram displays one plan to create and support this type of training delivery. While various approaches are being studied, this approach was originally proposed in a white paper by the U.S. Army Training Support Center for their Distributed Training Strategy (DTS). It is presented here in some detail as an innovation so that one analysis of distributed training requirements might be appropriately represented in training system designs, and in the TRASER program. In this approach, the development of distributed training programs and materiel is made up of five types of activities. First, given cost-effectiveness data on task training methodologies that support distributed training, develop a method for selecting which of the available types of distributed training techniques to use for each of the types of weapon system training to be considered for distributed training. Alternatively, relative cost-effectiveness rankings, similar to TAEG Report 16 (Braby, et al 1975), could be used. Second, since manuals, handbooks and other instructional aids are basic materials for distributed training, these paper, film, and courseware resources should be made more useful for this purpose by the existence of an index by which information is associated with specific weapon system tasks. Therefore, a cross-index of materials and tasks is developed. Third, NCO trainers have limited time or resources with which to prepare to train their soldiers in any specific weapon system task. Therefore, general training outlines should be prepared for each weapon system task. Based on the output of the Task Training Methodology Selection Model, and the index of task information, these outlines should identify specific available resources to be used, and method of use, and should be prepared for each weapon system task. Fourth, management of distributed training should be automated to the extent possible so as to not add new demands on unit personnel. Therefore, a Task and Duty Position Certification Process should be created using computer technology for keeping records of soldier accomplishments within units. Fifth, an Army-wide program should be created to manage distributed training materiel and services. A "Soldier Training Institute" type operation should be created to distribute materiel and to manage the Army-wide program. Locally, a series of facilities will need to be created or enhanced, including improved Army Learning Centers, teleconferencing Facilities, Libraries, and Electronic Classrooms. The output of this diagram is a Distributed Training Program offering materiel and services for technical training. While not limited to training for the operation, maintenance, support and tactical employment of weapon systems, it should provide substantial support to these functions.

USED AT:	AUTHOR: Braby	DATE: 1/10/90		WORKING	READER	DATE	CONTEXT:
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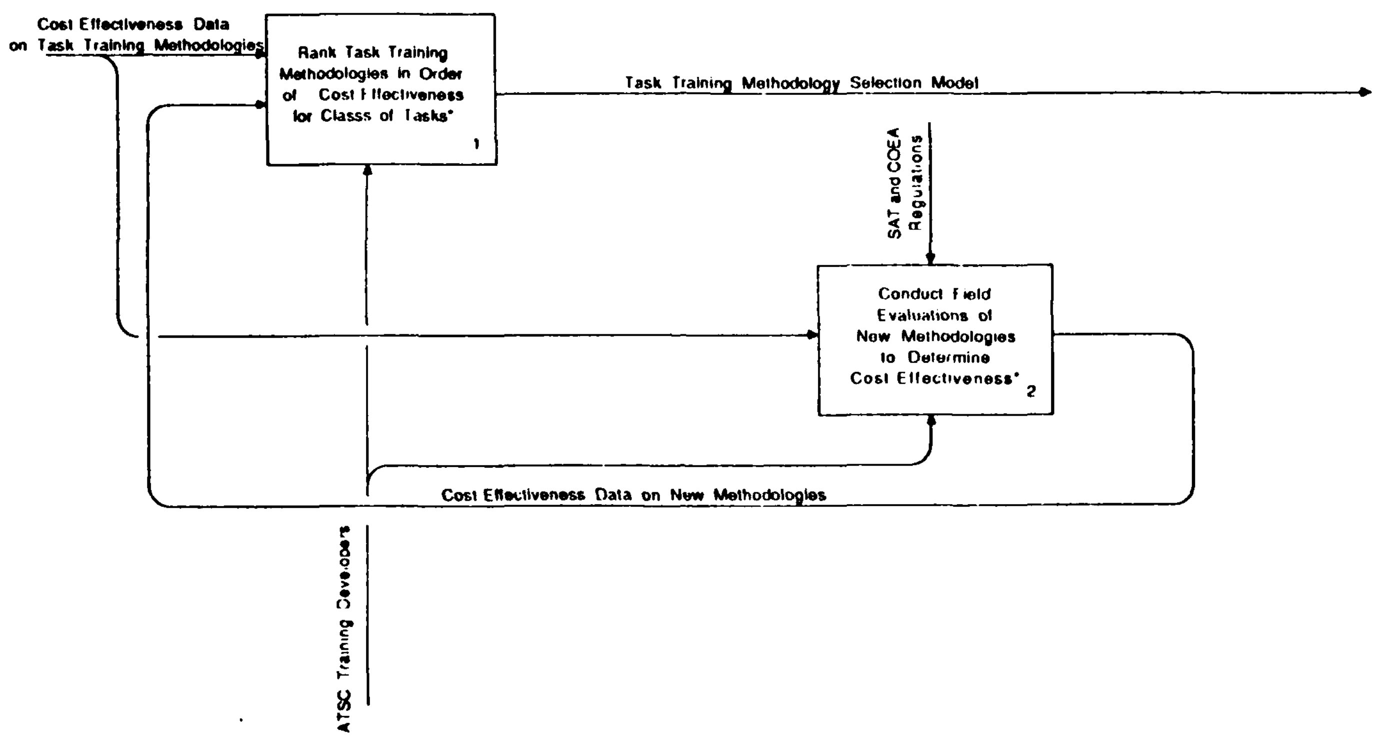

NODE:	TITLE:	NUMBER:
TRASER A032251	Develop Task Training Methodology Selection Model for Weapon System	

A032251 DEVELOP TASK TRAINING METHODOLOGY SELECTION MODEL FOR WEAPON SYSTEM

The diagram separates this function into two operations. First, given cost- effectiveness data on task training methodologies, the operation ranks the task training methodologies that are selected for consideration into an order of cost-effectiveness for various classes of tasks and phases of training. This task would be performed centrally by ATSC training developers and would express command-approved alternatives for classes of tasks and the order in which the alternatives should be considered. The application of this operation, by itself, would result in a static procedure that would soon be out of date, and out of acceptance by training developers. To overcome this situation the second operation is needed. In this operation new methodologies and technologies would be identified for specific classes of tasks. Formal field evaluations would be conducted to determine the relative effectiveness and cost of these new techniques when compared with the methodologies and technologies currently in use. These data would be used in updating the Task Training Methodology Selection Model.

USED AT:	AUTHOR: B.aby	DATE: 1/10/90		WORKING	READER	DATE	CONTEXT:
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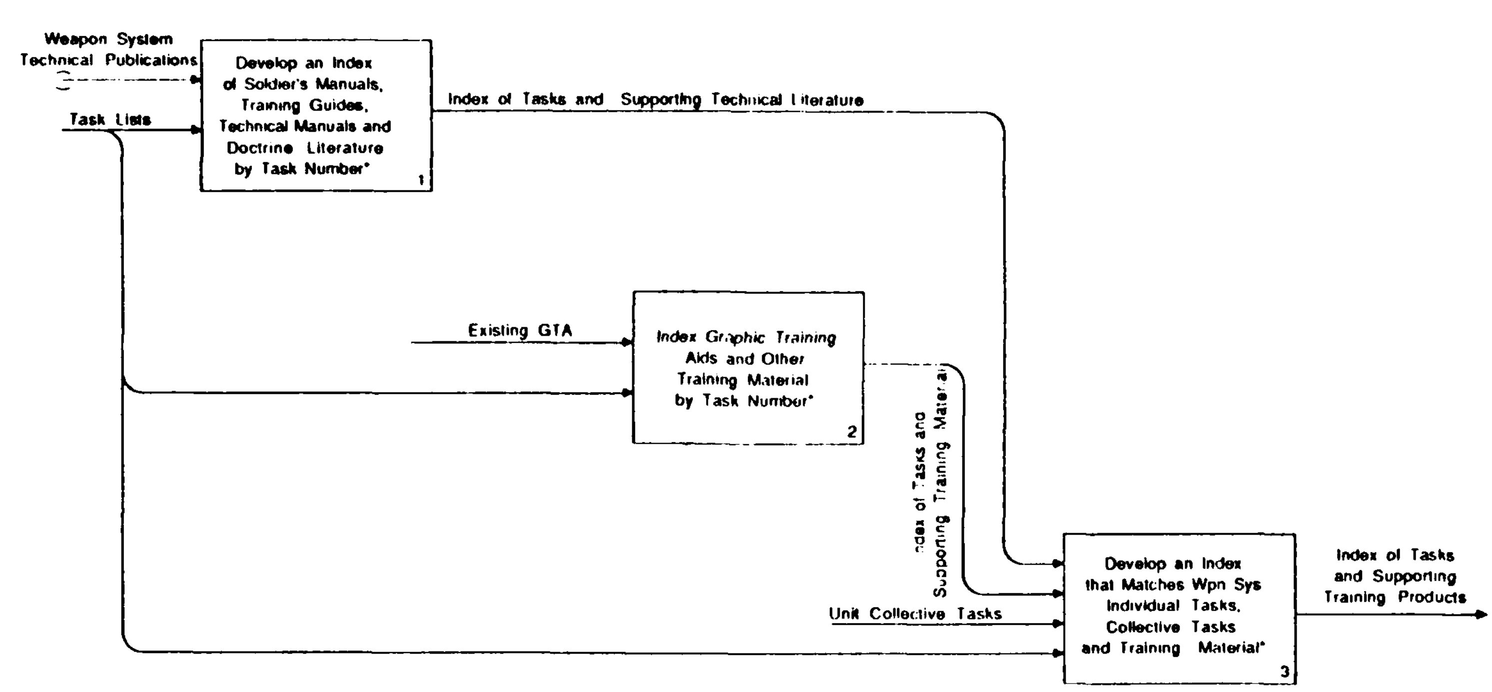

NODE:	TITLE:	NUMBER:
TRASER A032252	Index Weapon System Tasks with Training Materials	

TRASER A032252 INDEX WEAPON SYSTEM TASKS WITH TRAINING MATERIALS

This diagram concerns preparing a special index to existing weapon system publications and other materials used in weapon system training. This detailed index would make these materials more useful for training in that all material to support each specific weapon system task would be listed together. In order to develop the index, existing WS manuals and other training publications and materials would be collected. The official lists of individual and collective tasks would also be used. From these materials, a computer data base would be created in which a crosswalk is made between specific tasks and specific paragraphs or segments in the training materials. The output of this diagram is the data base containing this crosswalk.

USED AT:	AUTHOR: Braby	DATE: 1/10/90	WORKING	READER	DATE	CONTEXT:
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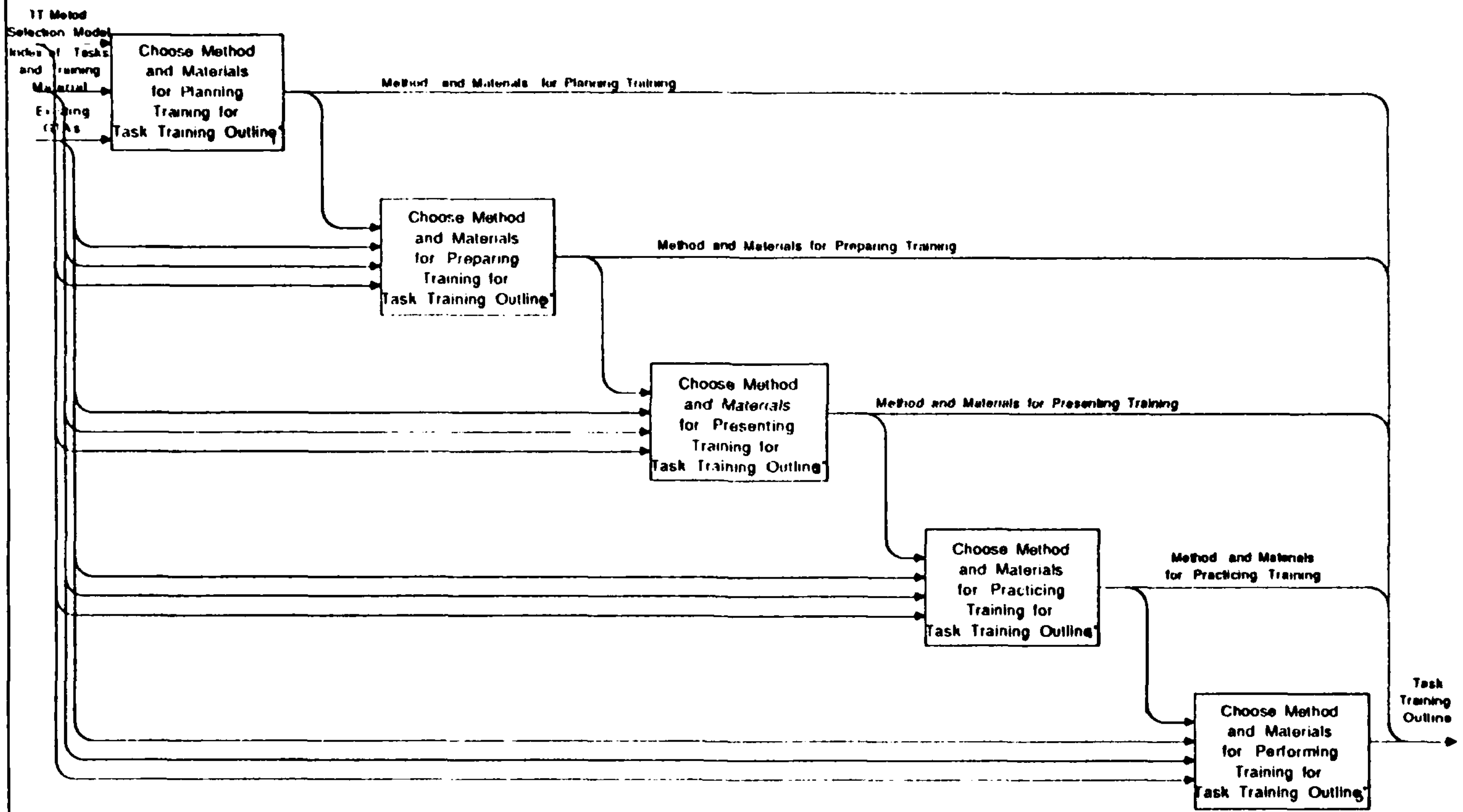

NODE:	TITLE:	NUMBER:
TRASER A032253	Develop NCO Task Training Outlines	

TRASER A032253 DEVELOP NCO TASK TRAINING OUTLINES

The operations in this diagram concern the content and process to be used in creating Training Outlines. Three types of data are used in this process: the output of the Task Training Methodology Selection Model, the output of the data base for crosswalks of tasks and training support products, and the list of training system design elements available for distributed training. Using these sources of data and NCO training expertise, six separate segments of each Training Outline are prepared. These six segments support the five phases of training: planning, preparing, presenting, practicing, and performing. Easily understood and complete directions are to be given the NCO Trainer for each of these phases of training and for each weapon system task. The output of the activities depicted on this diagram is a complete set of Training Outlines for a weapon system.

USED AT:	AUTHOR: Braby	DATE: 1/10/90	WORKING	READER	DATE	CONTEXT:
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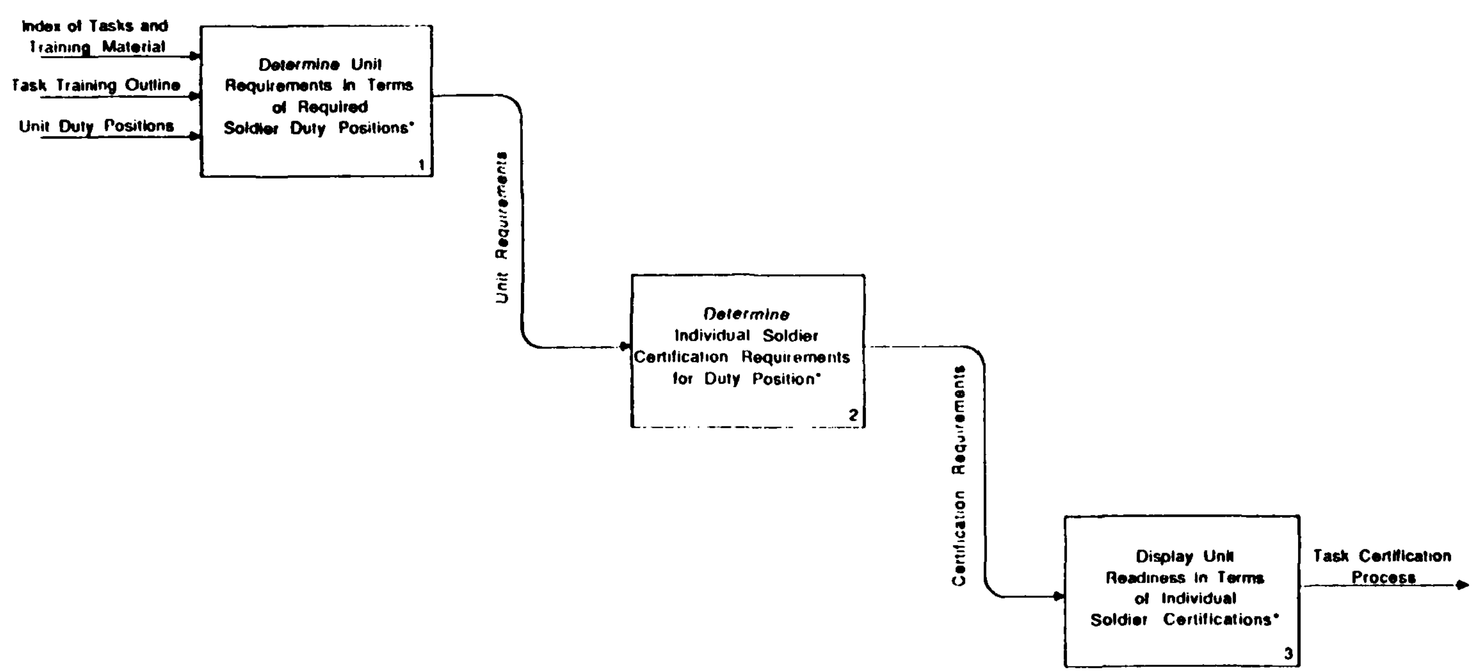

NODE:	TITLE:	NUMBER:
TRASER A032254	Develop Duty Position Certification	

TRASER A032254 DEVELOP DUTY POSITION CERTIFICATION

The operations displayed on this diagram depict the three major phases in the development of a computer routine to support unit training in which distributed training resources are used. The purpose of this routine is to track the training accomplishments of soldiers assigned to each duty position, and to compare these against training standards. Three types of routines are needed. First, a routine is needed that, given a mission essential collective or battle task, analyzes the task to determine the required operations for each duty position in the unit, and in turn checks this against the training status of soldiers assigned to these duty positions. Training shortfalls are identified for the unit. Second, another routine is needed to guide NCO trainers in training individual soldiers. This routine will match an individual soldier's training accomplishments against standard requirements for certification in assigned duty positions, and identify training yet to be accomplished for each soldier. It could also be used to check an individual soldier's readiness to perform his duty position in a specific mission. The third routine is to analyze missions assigned to a unit and display the unit's readiness to perform a set of these missions based on soldiers' readiness to perform in required duty positions. This output of the activities shown on this diagram is software for a task certification process.

USED AT:	AUTHOR: Braby	DATE: 1/10/90		WORKING	READER	DATE	CONTEXT:
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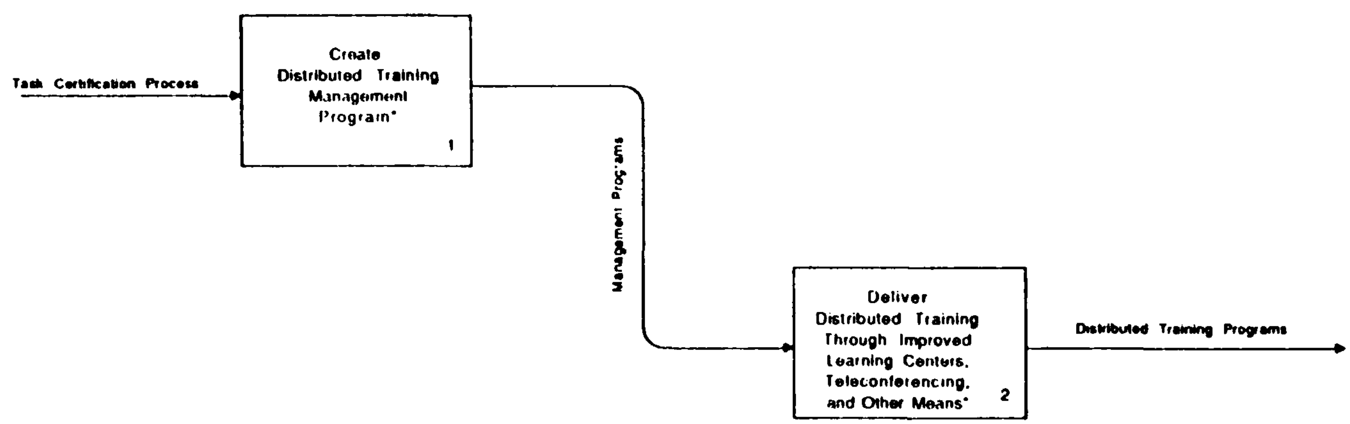

NODE:	TITLE:	NUMBER:
TRASER A032255	Develop Accreditation Program	

TRASER A032255 DEVELOP ACCREDITATION PROGRAM

The activities in this diagram depict the two major activities in creating an Accreditation Program for distributed training. This means the development of an Army-wide distributed training management system and an distributed training instructional delivery system. Given a task certification process for use in units, the first of the two activities depicted on this diagram is to create an organization to manage the distribution of distributed training resources and services, and to perform other Army-wide functions such as planning and budgeting. One name for such an organization could be the "Soldier Training Institute". The second activity depicted on this diagram is to prepare to deliver distributed training through correspondence courses and through facilities in the immediate location of the units being served. This means to provide training through improved Army Learning Centers, teleconferencing facilities, electronic classrooms, libraries, and similar means. The output of these activities is distributed training programs, materials and services supporting weapon system training delivered from a central location via facilities that are in the immediate area of the units being served. This activity would need to be performed only once to establish the general structure, currently in similar form at ATSC. For each specific weapon system training system design, specific implementation modifications would need to be made.

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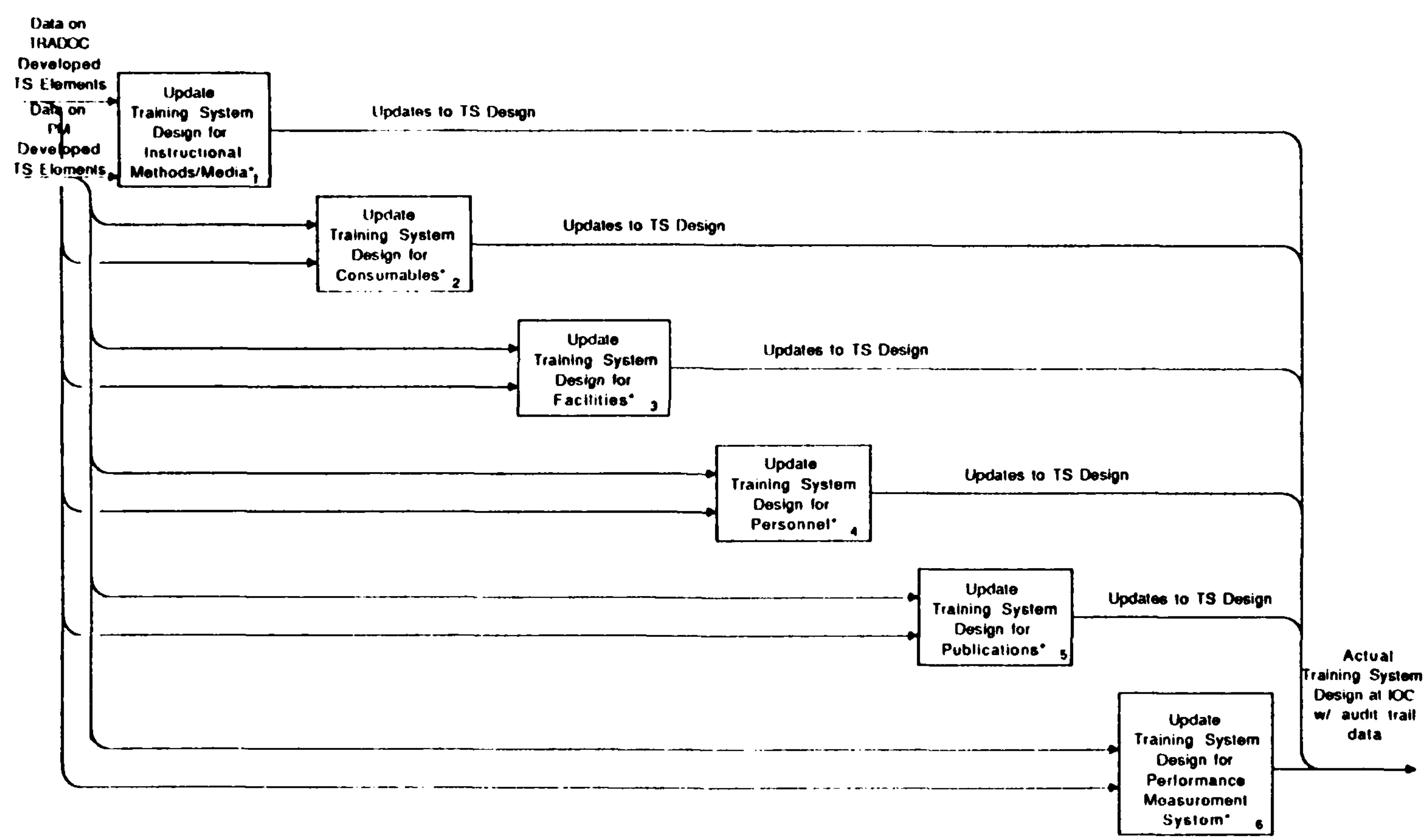

NODE: TRASER A033	TITLE: Update Actual Training System Design	NUMBER:

TRASER A033 UPDATE ACTUAL TRAINING SYSTEM DESIGN

This activity creates a record of the training system actually developed during the full scale development of the new weapon system. Up to this time in the development cycle the training system has been a concept, a plan, and then contracted development items and development programs within TRADOC, but not the actual tested training system elements. However, at this point in the development cycle, there are actual components of the training system that are in prototype form. The training design that is the product of this full scale development effort is called the "actual training system design". Given data on the actual PM developed training system elements, and data on the actual TRADOC developed training system elements, the operations displayed on this diagram are the updating of the various categories of elements in the TRASER training system design. The output of this effort is the actual training system design and at this stage in the development of the weapon system describes the training system that is available at IOC. This actual training system design is to be maintained throughout the life of the weapon system as a record of the actual training system design elements that are in place at that time.

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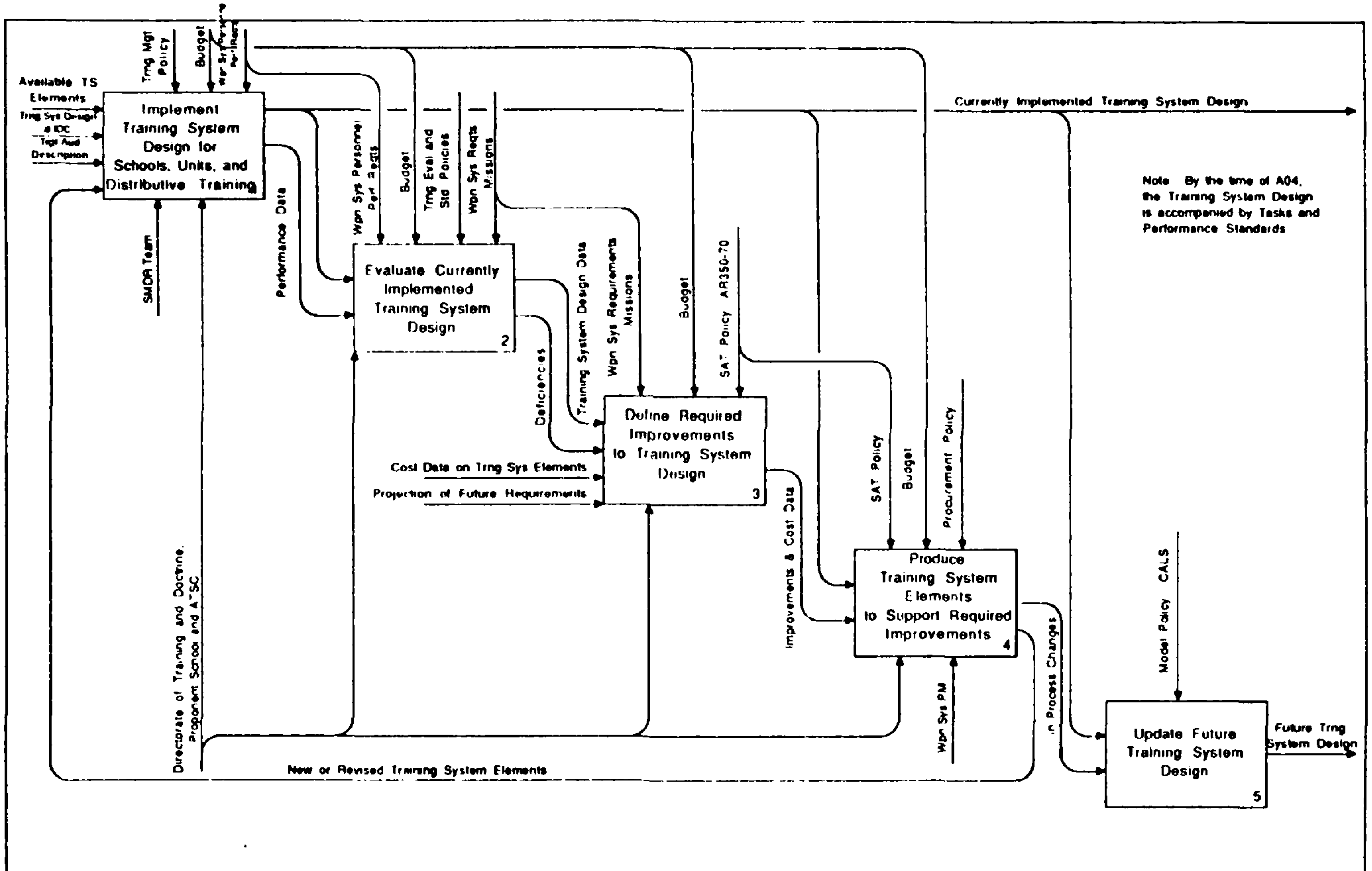

NODE:	TITLE:	NUMBER:
TRASER A04	Support Implementation of Training System Design	

TRASER A04 SUPPORT IMPLEMENTATION OF TRAINING SYSTEM DESIGN

This diagram presents the major activities used in implementing the training system as designed for IOC, and the cycle of events necessary to initially achieve and then maintain the required quality of training throughout the useful life of the weapon system. This includes training necessary to operate, maintain, employ and support the weapon system. It includes training provided in resident service schools, in units and through distributed training. Three versions of the training system design are maintained. One system design is for the contract period and documents the intended design at IOC. It is this design that has guided the weapon system program manager (PM) at the Army Materiel Command (AMC) in contracting for trainers and other training materials and services, and serves as a starting point for the implementation of training. This version of the training system design contains all the elements of the training system to be built or provided by TRADOC, and is intended to serve as a guide to this part of the process. As training is actually started, another version of the training system design is created. It is the Currently Implemented Training System Design and is frequently updated. This design documents the state of the training system at any given period of time. It is useful in evaluating the current effectiveness of the training system. The third design is the Future Training System Design which documents the changes that are being created, but not yet introduced into the training system. This design is useful in coordinating changes to the system to improve the effectiveness of the training program.

The process described is an extension of current practices. While it is more systematic and precise than what now is done, it is based on functions now being performed. It concerns the implementation of planned training, the evaluation of this training, the defining of required improvements, the development and implementation of these improvements, and the ongoing maintenance of the various versions of the training system design to guide this process.

USED AT:	AUTHOR: Braby	DATE: 1/3/90	WORKING	READER	DATE	CONTEXT:
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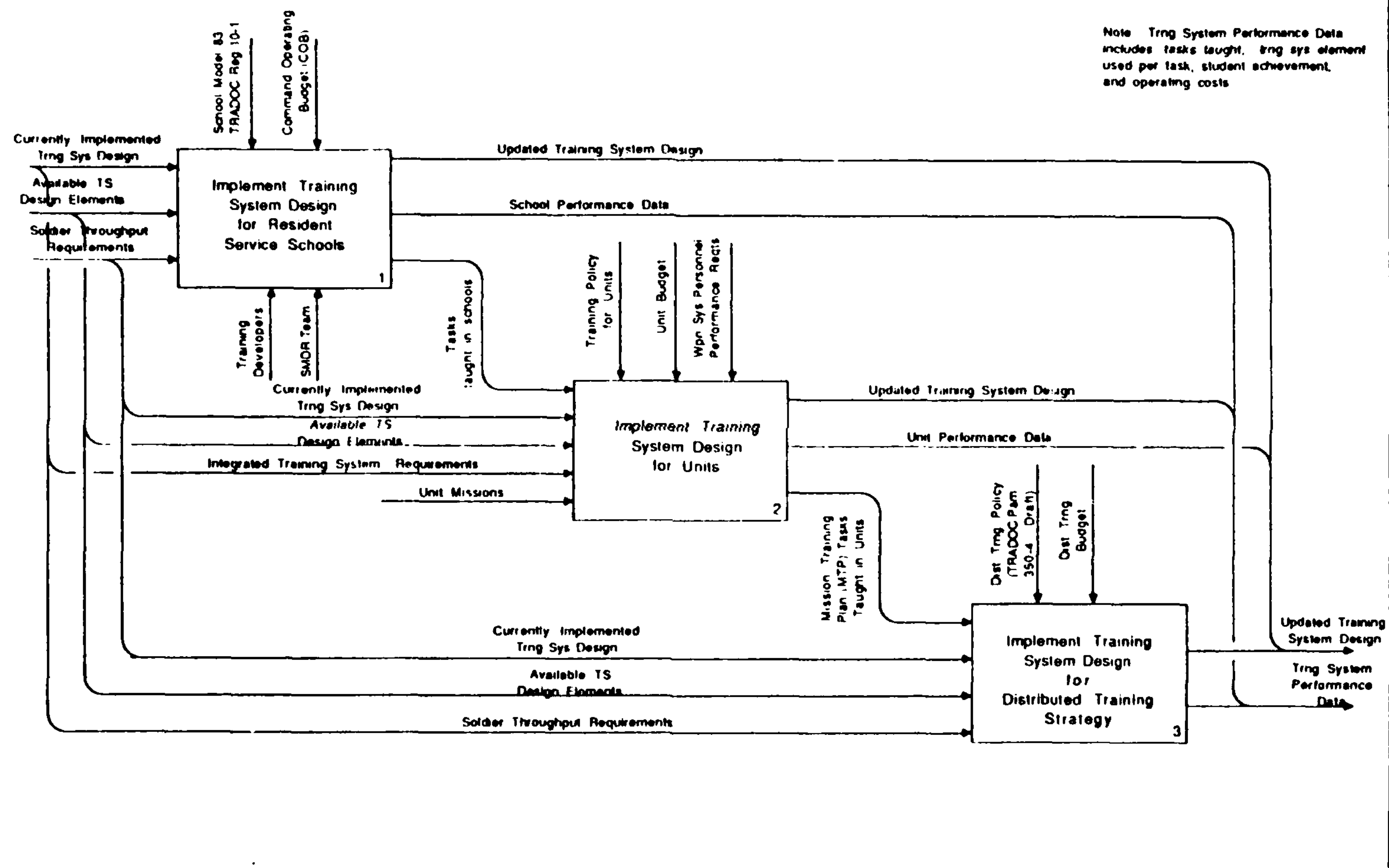
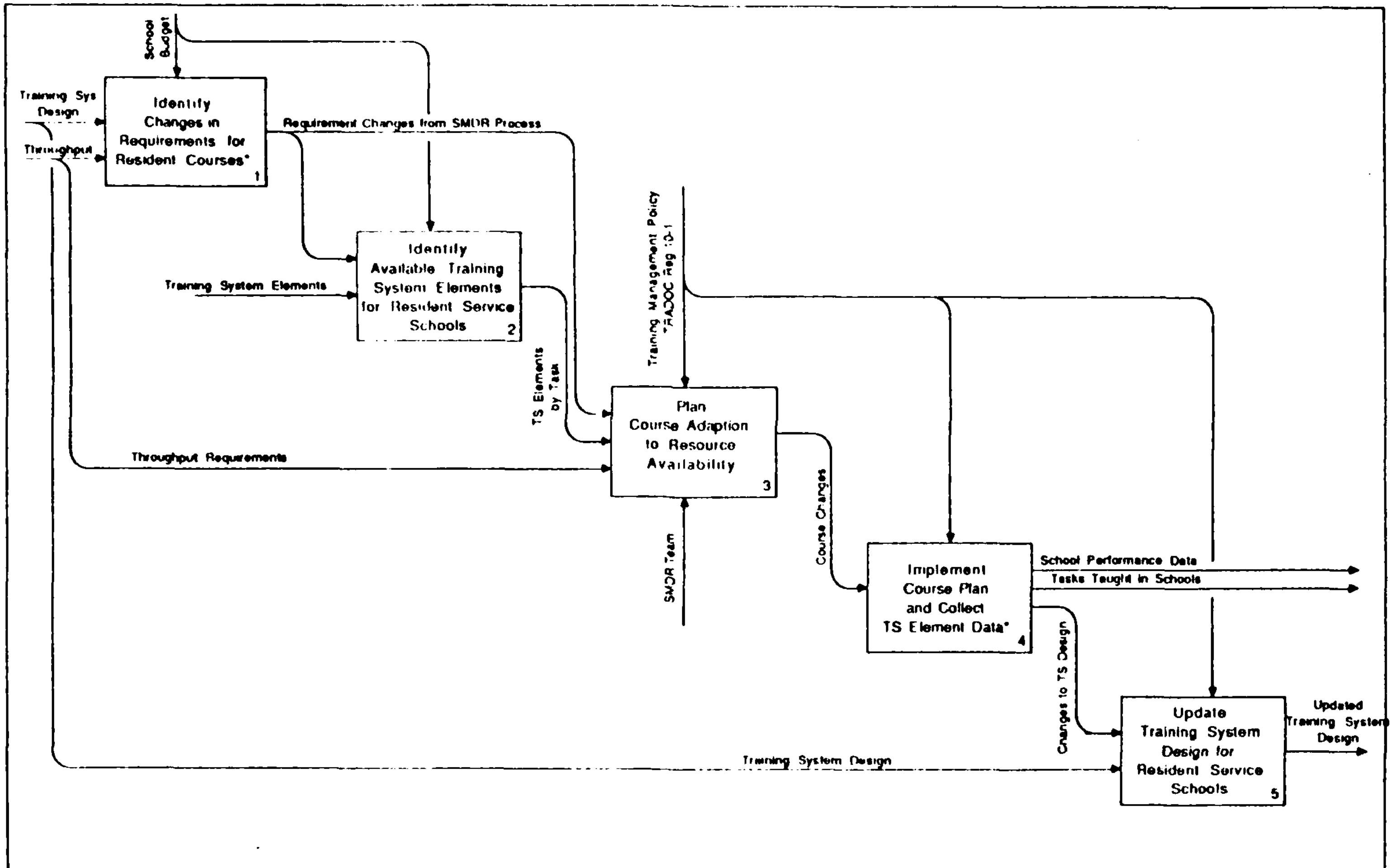


NODE:	TITLE:	NUMBER:
TRASER A041	Implement Training System Design for Resident Schools, Units, and Distributed Training	

TRASER A041 IMPLEMENT TRAINING SYSTEM DESIGN FOR RESIDENT SCHOOLS, UNITS, AND DISTRIBUTED TRAINING

Weapon system training is implemented in three broad areas. They are resident service schools, units, and distributed training. While these efforts are loosely coordinated, they are independent programs. Each has its role in training Army personnel to operate, maintain, employ and support a new weapon system. The broad processes of implementing training in each of these domains will be discussed separately using the three activities presented in this diagram.

USED AT: Winter Park	AUTHOR: Braby DATE: 1/3/90 PROJECT: TRASER REV: 1 NOTES: 1 2 3 4 5 6 7 8 9 10	WORKING DRAFT RECOMMENDED PUBLICATION	READER DATE	CONTEXT: A041



NODE: TRASER A0411	TITLE: Implement Training System Design for Resident Service Schools	NUMBER:

TRASER A0411 IMPLEMENT TRAINING SYSTEM DESIGN FOR RESIDENT SERVICE SCHOOLS

When a school implements a new training program, it must adapt the preconceived training system design to the realities that exist at the time of implementation. The broad process of adapting to these realities is noted in the five activities on this diagram. Realities that must be adapted to include changes in available funds, and training system design elements that actually are or are not available. It is necessary to plan how to adapt each course to meet current requirements, as defined by the Structure Manning Decision Review (SMDR) process, with available resources. As courses are adapted and implemented, data on student performance and cost must be collected for use in evaluating the training and cost-effectiveness of the course as being taught. To support later evaluation, student performance on specific tasks should be associated with the training system design elements used and the cost of using these elements.

USED AT:	AUTHOR: Braby	DATE: 1/3/90		WORKING	READER	DATE	CONTEXT:
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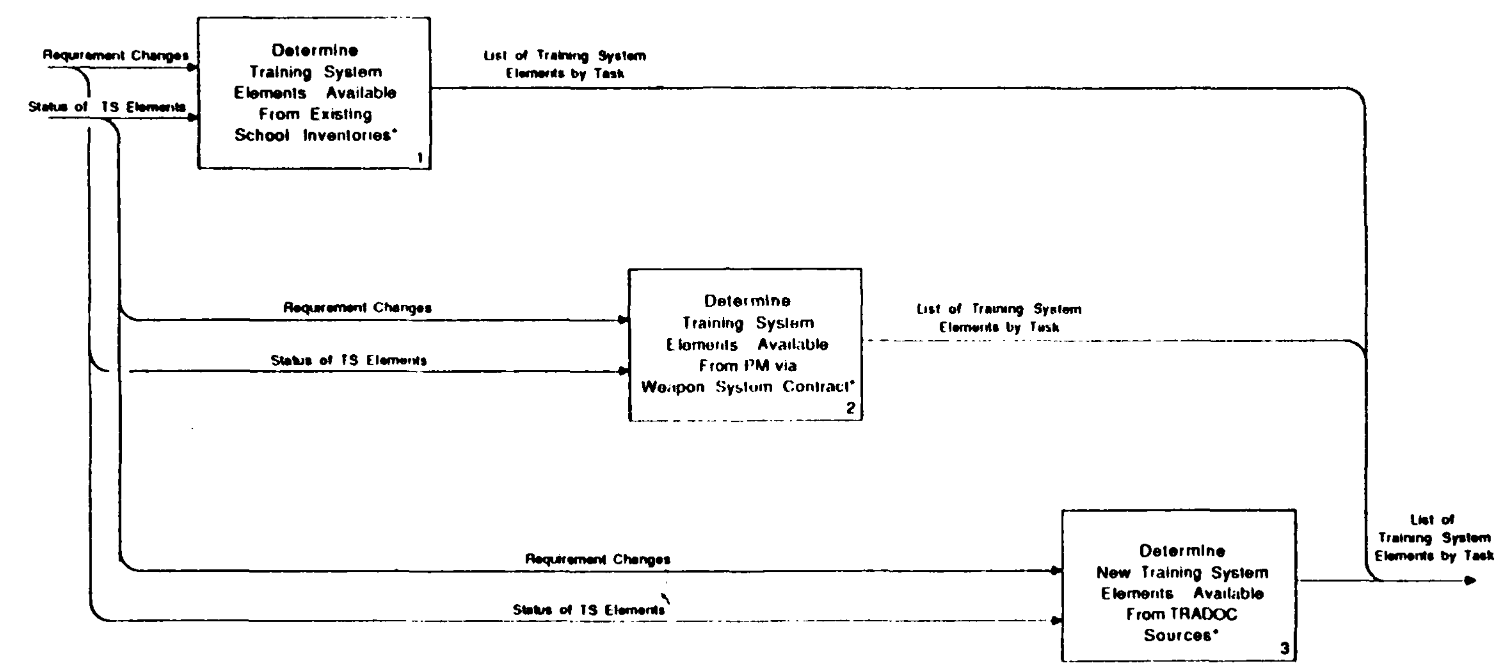

NODE:	TITLE:	NUMBER:
TRASER A04112	Identify Available Training System Elements for Resident Service Schools	

TRASER A04112 IDENTIFY AVAILABLE TRAINING SYSTEM ELEMENTS FOR RESIDENT SERVICE SCHOOLS

Changing requirements is an ever present reality in all institutions, including Army resident service schools. These schools must adapt to these changing requirements. Changes can be expressed as modified soldier tasks, or as newly defined productivity or effectiveness requirements for the school. Given changes in requirements and the status of training system elements available to schools, the school training developers attempt to adapt the program to meet these current needs. There are three sources of training system design elements available to meet these immediate needs. First there are resources within the school, either in the form of existing materials, personnel and other elements of training system design or as an in-school capability to create materials and employ new methods. Second, the PM may be able to provide resources to support design changes or modernization efforts. And third, other TRADOC sources may provide the materials and guidance needed to adapt to changing requirements. In terms of the IDEFo diagrams, the output of these activities is a list of training system elements available to be used in updating the resident service school part of the training system design.

USED AT: Winter Park	AUTHOR: Braby	DATE: 1/3/90		WORKING	READER	DATE	CONTEXT: A0411
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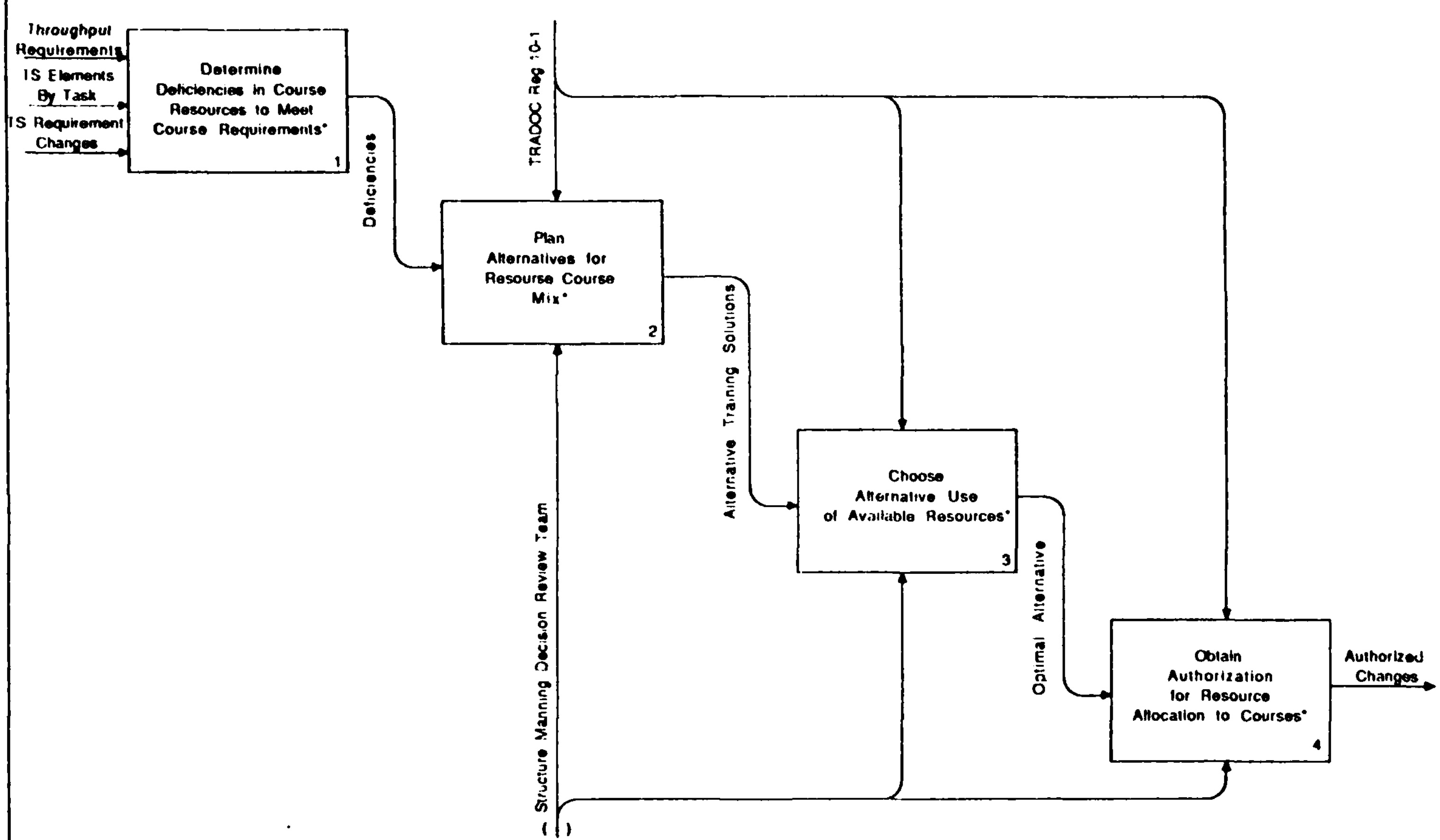
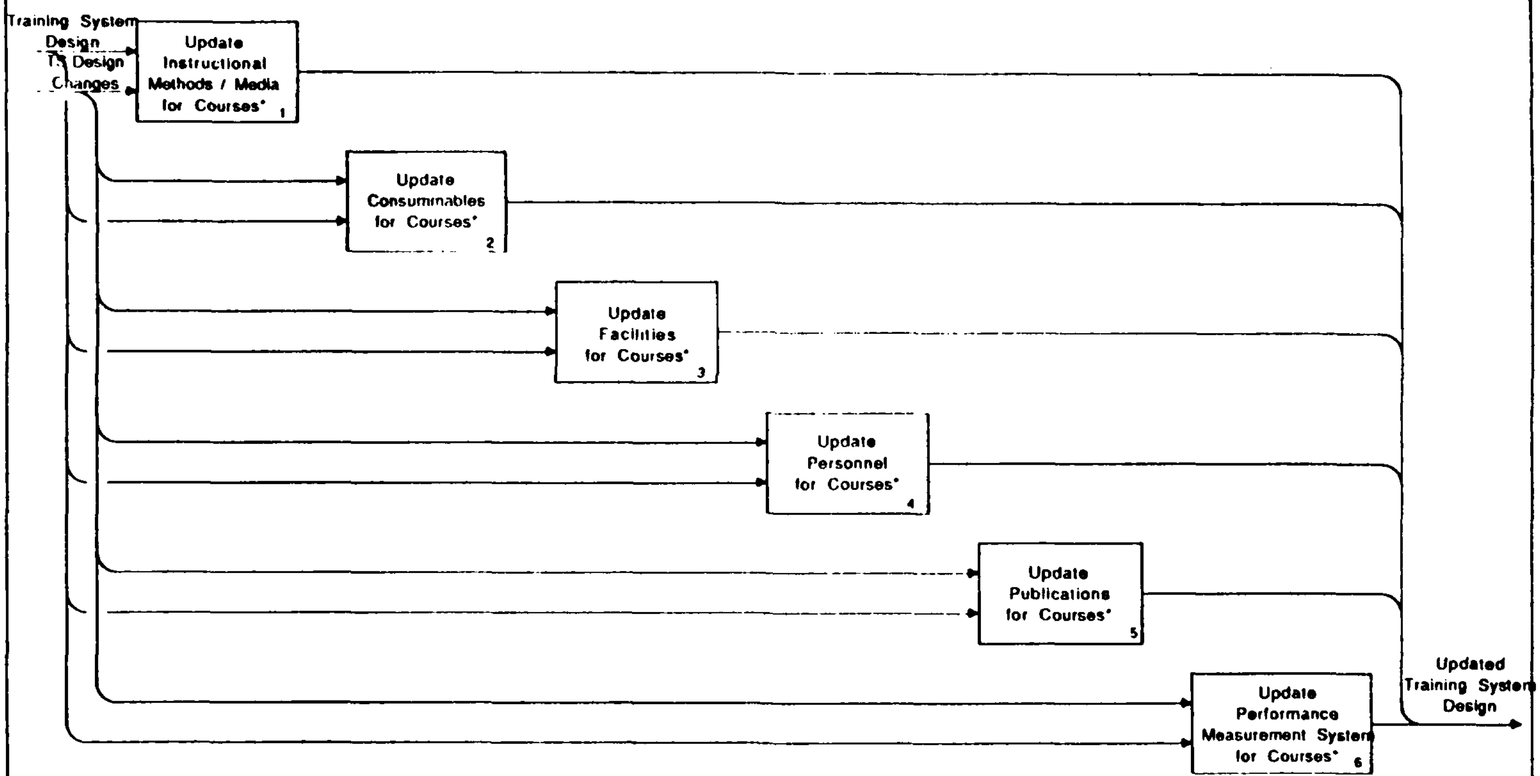


NODE: TRASER A04113	TITLE: Plan Course Adaption to Resource Availability	NUMBER:

TRASER A04113 PLAN COURSE ADAPTION TO RESOURCE AVAILABILITY

The activities in this diagram concern the revising of the training system design for a course in a resident service school to meet changing requirements. Given changes in required throughput and tasks to be taught, and available training system design elements that support these changed tasks, this diagram depicts the process of planning the required changes to the training system design. This is a logical process that starts by determining deficiencies in the existing course to meet the new requirements. With clearly stated deficiencies and lists of available resources, the next step is to define alternative solutions. These solutions are subjected to evaluation and one set of solutions is selected for implementation. If the proposed changes require authorization from higher authority, this approval is obtained. The output of these activities is a set of authorized changes to the POI for the course.

USED AT: Winter Park	AUTHOR: Braby DATE: 1/3/90 PROJECT: TRASER REV: 1 NOTES: 1 2 3 4 5 6 7 8 9 10	WORKING DRAFT RECOMMENDED PUBLICATION	READER DATE	CONTEXT: A0411



NODE: TRASER A04115

TITLE: Update Training System Design for Resident Service Schools

NUMBER:

TRASER A04115 UPDATE THE TRAINING SYSTEM DESIGN FOR RESIDENT SERVICE SCHOOLS.

The activities on this diagram are necessary to maintain a current version of the training system design. The Training System Design is made up of those elements found in Appendix E, Definitions of Training System Design Elements. A comprehensive set of design elements are listed under six design headings. These headings are: INSTRUCTIONAL MEDIA/METHODS, CONSUMMABLES, FACILITIES, PERSONNEL, PUBLICATIONS, AND PERFORMANCE MEASUREMENT SYSTEMS. The individual elements under these heading are considered to be the building blocks of a training system. A training system design is a specification made up of a comprehensive set of these building blocks.

USED AT:	AUTHOR: Braby	DATE: 1/3/90	WORKING	READER	DATE	CONTEXT:
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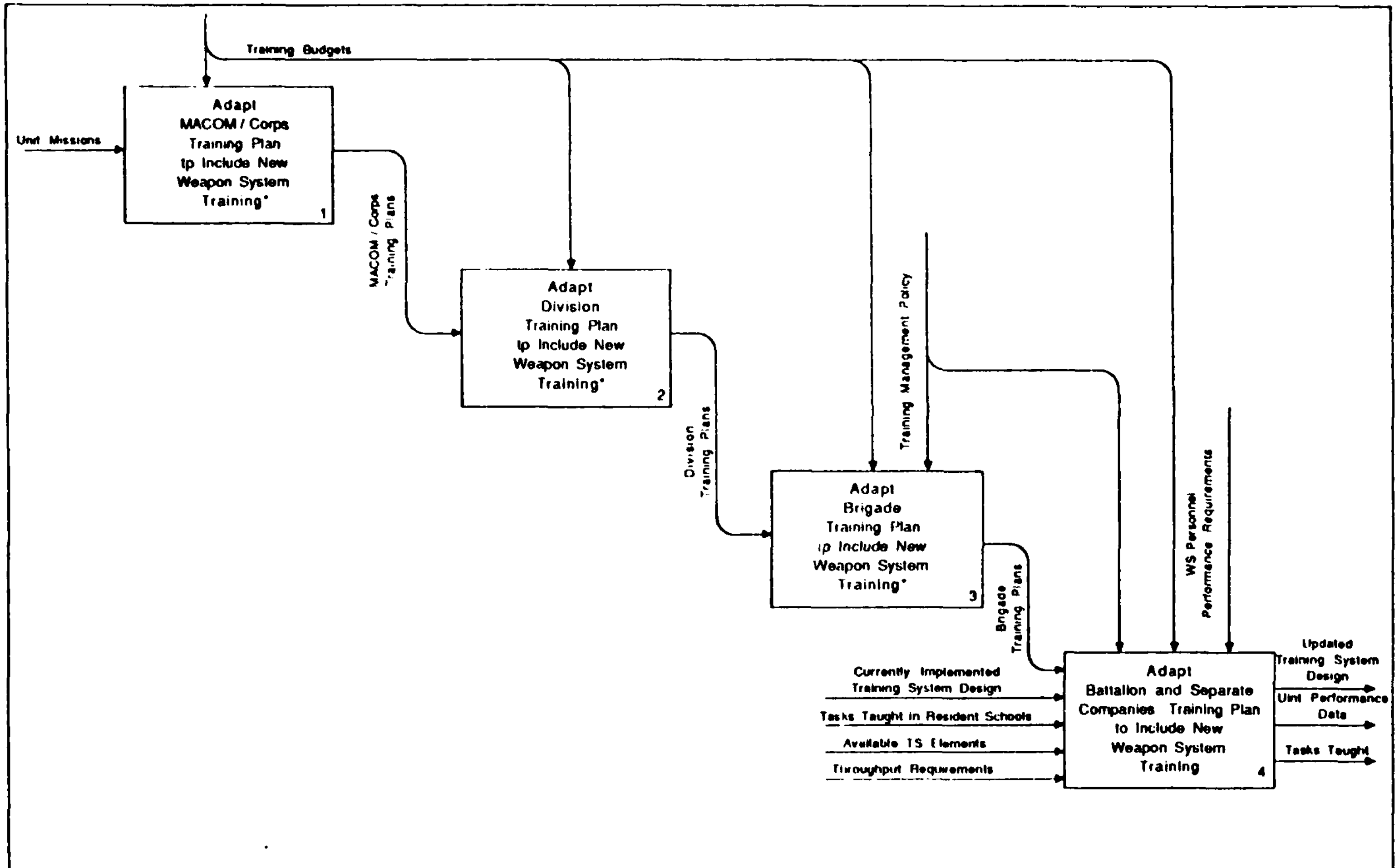

NODE:	TITLE:	NUMBER:
TRASER A0412	Implement Training System Design for Units	

TRASER A0412 IMPLEMENT TRAINING SYSTEM DESIGN FOR UNITS

Given anticipated combined arms type missions in which the new weapon system will have a role, unit training will exercise this new weapon system in its roles in these missions. Unit training will also train the operators of other types of weapon systems to work with the new weapon system, as an integrated combined arms team. The planning of training for this integration of the new weapon system into Army unit missions takes place at various levels. Some of the planning takes place with the MACOM or Corps training plan, which places directives to be met in the Division and Brigade training plans. The detailed planning to meet these higher level requirements takes place with the development of the Battalion or Separate Company training plans. The goal at this level is to plan a set of activities using available resources to prepare the unit to use the new weapon system in carrying out assigned missions.

USED AT:	AUTHOR: Braby	DATE: 1/3/90	WORKING	READER	DATE	CONTEXT:
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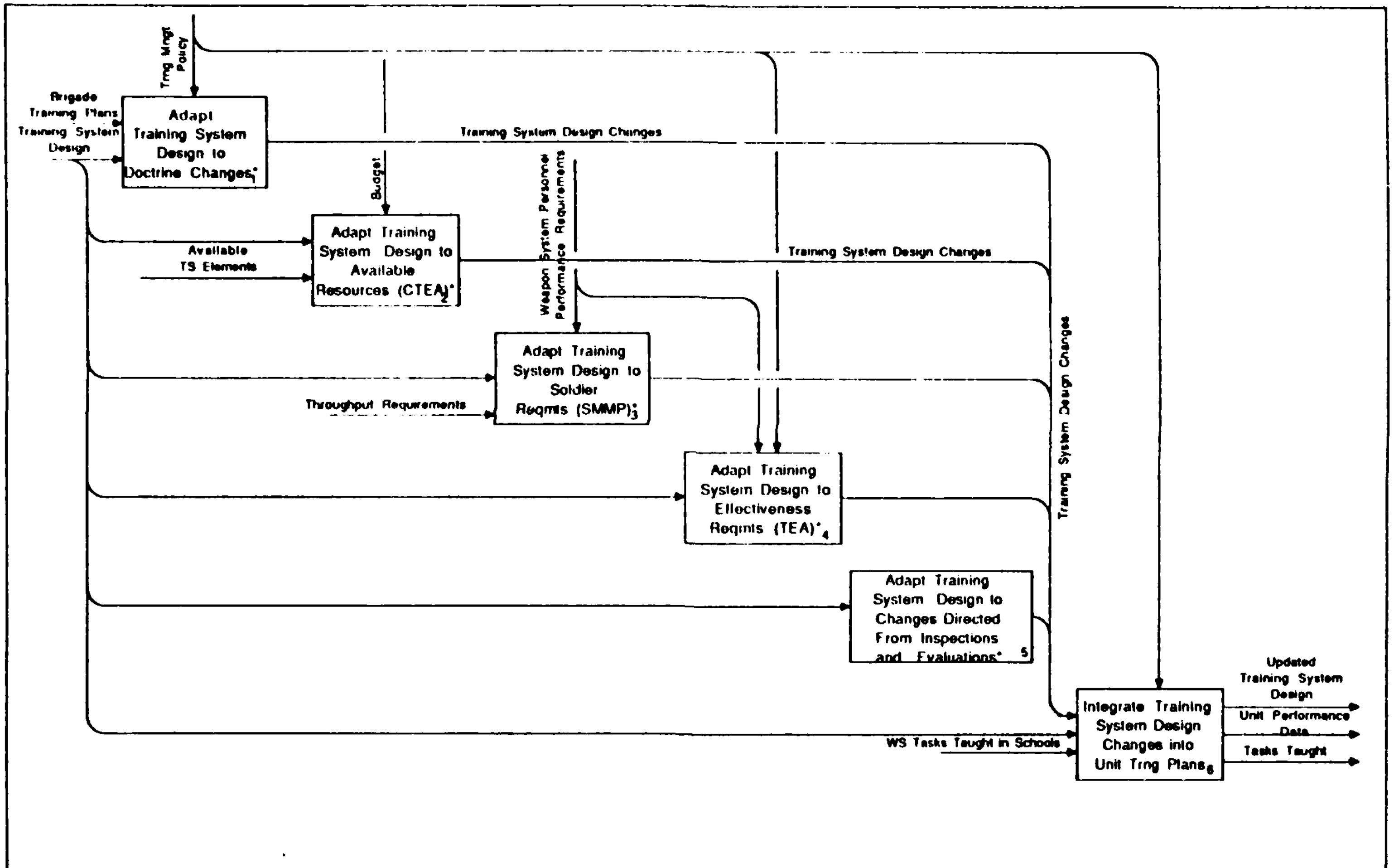
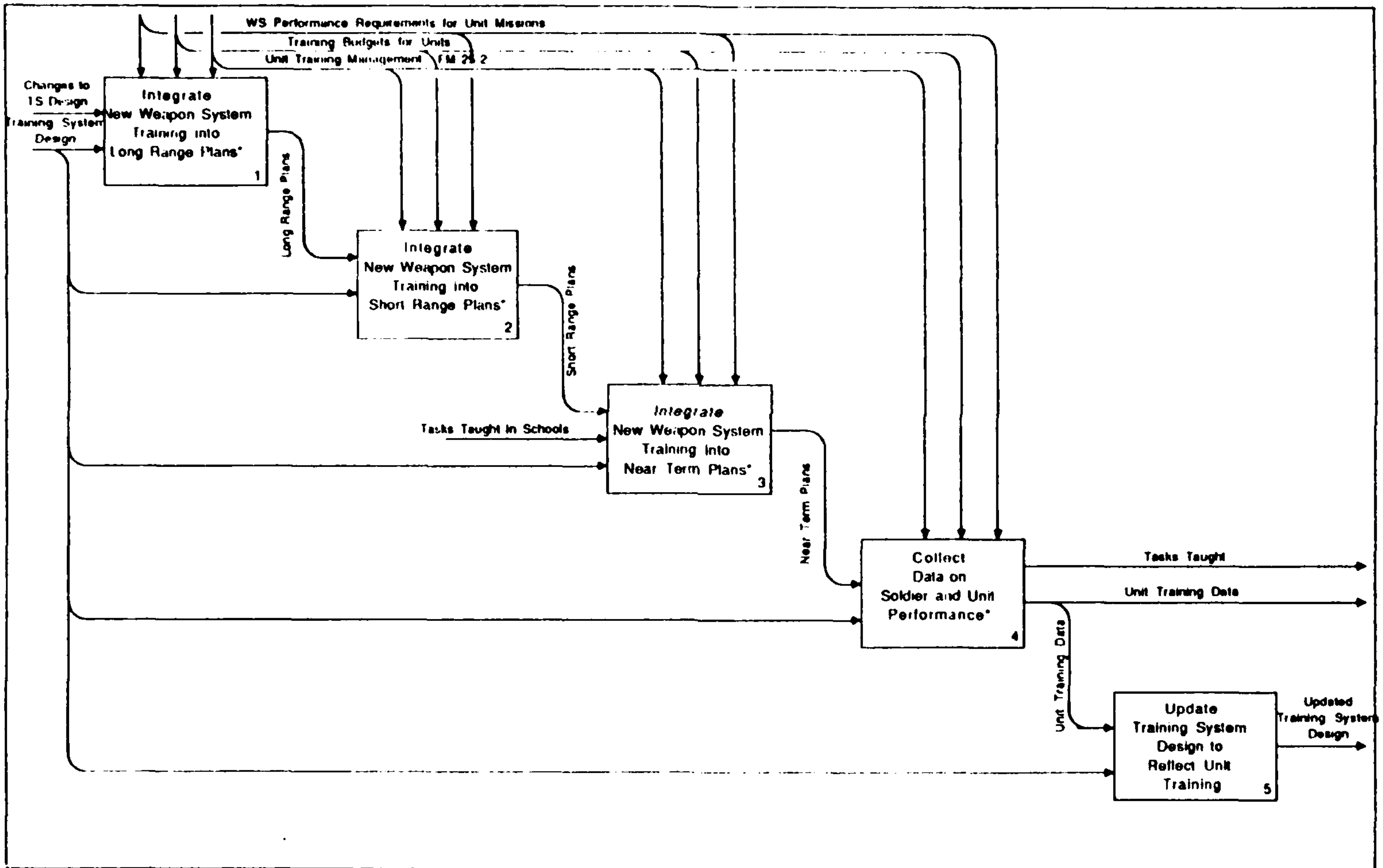


NODE:	TITLE:	NUMBER:
TRASER A04124	Adapt Battalion and Separate Companies Training Plans to Include New Weapon System Training	

TRASER A04124 ADAPT BATTALION AND SEPARATE COMPANIES TRAINING PLANS TO INCLUDE NEW WEAPON SYSTEM TRAINING

The Battalion and Separate Company training plans must adapt to the realities of the command's specific conditions. The preplanned unit training system design provides products and services to assist in this training, but cannot be responsive to the many complex and shifting conditions in the field. Given the unit training system design for a new weapon system, the Battalion or Separate Company must create or adapt the plan to meet the requirements of higher authority including assigned participation in exercises, and to take into account changes in doctrine or task performance guidelines, available funds and other resources, existing soldier skill levels, and new or restated weapon effectiveness standards. After implementing training, a record of training activities including resources used is to be documented in the form of an updated training system design for units.

USED AT: Winter Park	AUTHOR: Braby DATE: 1/3/90 PROJECT: TRASER REV: 1 NOTES: 1 2 3 4 5 6 7 8 9 10	WORKING DRAFT RECOMMENDED PUBLICATION	READER DATE	CONTEXT: A04124

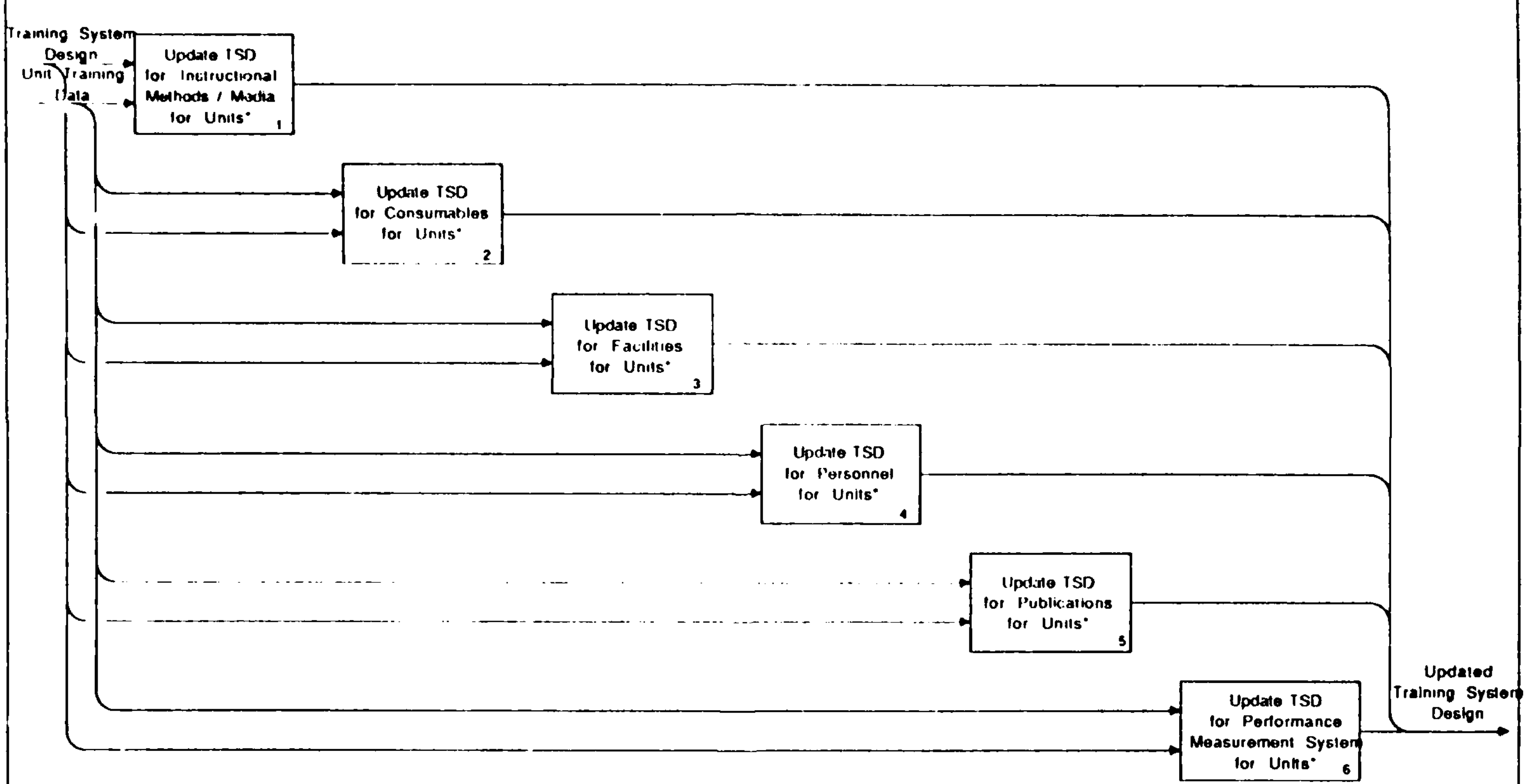


NODE: TRASER A041246	TITLE: Integrate Training System Design Changes into Unit Training Plans	NUMBER:

TRASER A041246 INTEGRATE TRAINING SYSTEM DESIGN CHANGES INTO UNIT TRAINING PLANS

Three levels of planning documents are prepared for unit training: Long Range Plans, Short Range Plans, and Near Term Plans. Units with new weapon systems, or units that must integrate with the use of these new weapon systems, must plan to exercise these new capabilities. As these plans are implemented, i.e., as exercises are conducted, performance data must be collected on weapon system crews and on the units employing the new systems. At the same time the training system design actually used to achieve these levels of performance must be documented. These data on performance and training system used will be an input to the evaluation of the effectiveness of the training system design during analyses such as the Post-Fielding Training Effectiveness Analysis.

USED AT: Winter Park	AUTHOR: Braby DATE: 1/3/90 PROJECT: TRASER REV: 1 NOTES: 1 2 3 4 5 6 7 8 9 10	WORKING DRAFT RECOMMENDED PUBLICATION	READER DATE	CONTEXT: A041246



NODE: TRASER A0412465

TITLE: Update Training System Design to Reflect Unit Training

NUMBER:

TRASER A0412465 UPDATE TRAINING SYSTEM DESIGN TO REFLECT UNIT TRAINING

The activities on this diagram are necessary to maintain a current version of the training system design for the various units using the new weapon system. The training system design is made up of those elements found in Appendix E, Definitions of Training System Design Elements. A comprehensive set of design elements are listed under six design headings. These heading are: INSTRUCTIONAL MEDIA/METHODS, CONSUMMABLES, FACILITIES, PERSONNEL, PUBLICATIONS, AND PERFORMANCE MEASUREMENT SYSTEMS. The individual elements under these headings are considered to be the building blocks of a training system. A training system design is a specification made up of a comprehensive set of these building blocks.

USED AT:	AUTHOR: Braby	DATE: 1/3/90	WORKING	READER	DATE	CONTEXT:
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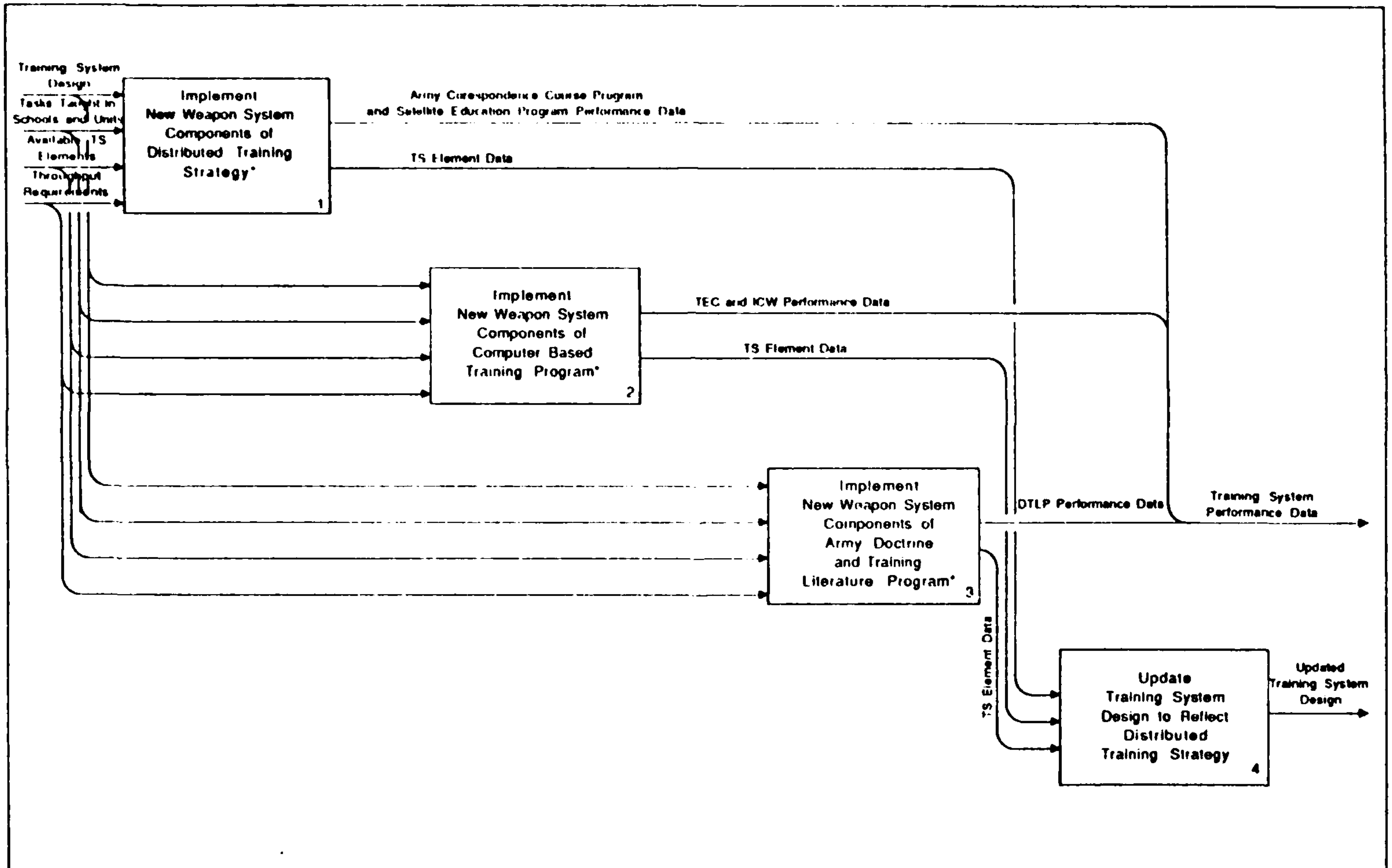
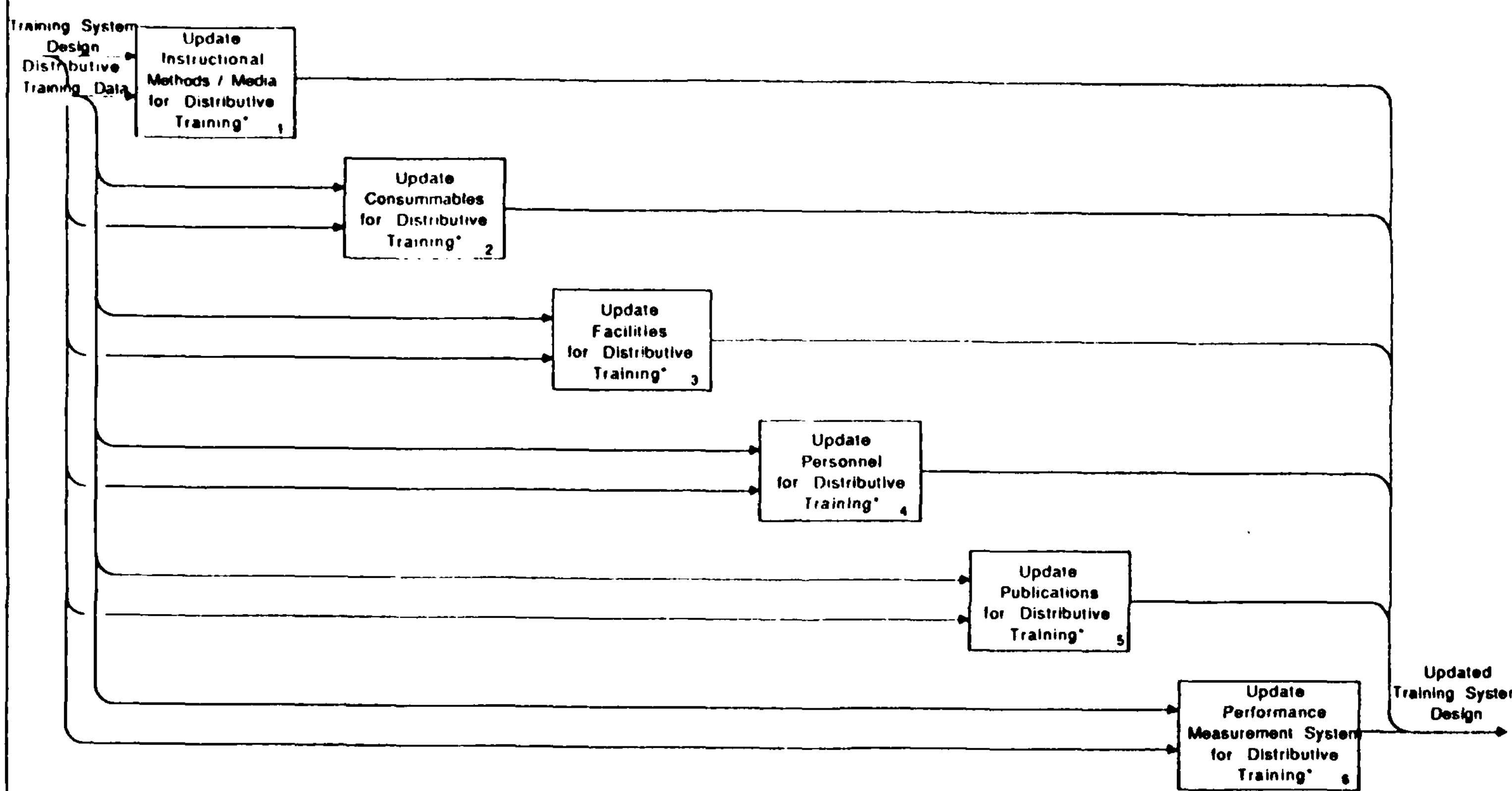


NODE:	TITLE:	NUMBER:
TRASER A0413	Implement Training System Design for Distributed Training Strategy	

TRASER A0413 IMPLEMENT TRAINING SYSTEM DESIGN FOR DISTRIBUTED TRAINING STRATEGY

Distributed training is being emphasized in today's Army training program. The activities on this diagram describe major types of distributed training products and services that can be used to train soldiers in the operation, maintenance, employment or support of a new weapon system. To the extent that these products and services have been developed, this diagram describes their implementation as a part of weapon system training. While distributed training in the past has been somewhat focused on Reserve training, under current initiatives it is to be used across Army training. Included are such activities as the Army Correspondence Course Program, Army School of the Air, including the new teleconferencing capabilities, Training Extension Course materials, interactive courseware, and the products of the Army Doctrine and Training Literature Program. Updating the training system design for distributed training in support of a specific weapon system is a part of a process of implementing distributed training strategy.

USED AT: Winter Park	AUTHOR: Braby PROJECT: TRASER NOTES: 1 2 3 4 5 6 7 8 9 10	DATE: 1/3/90 REV: 1		WORKING DRAFT RECOMMENDED PUBLICATION	READER	DATE	CONTEXT: A0413



NODE: TRASER A04134	TITLE: Update Training System Design to Reflect Distributed Training Strategy	NUMBER:

TRASER A04134 UPDATE TRAINING SYSTEM DESIGN TO REFLECT DISTRIBUTED TRAINING STRATEGY

The activities on this diagram are necessary to maintain a current version of the training system design incorporating distributed training. the training system design is made up of those elements found in Appendix E, Definitions of Training System Design Elements. A comprehensive set of design elements are listed under six design headings. These headings are: INSTRUCTIONAL MEDIA/METHODS, CONSUMMABLES, FACILITIES, PERSONNEL, PUBLICATIONS, AND PERFORMANCE MEASUREMENT SYSTEMS. The individual elements under these heading are considered to be the building blocks of a training system. A training system design for distributed training is a specification made up of an appropriate set of these building blocks.

USED AT:	AUTHOR: Braby	DATE: 1/3/90		WORKING	READER	DATE	CONTEXT:
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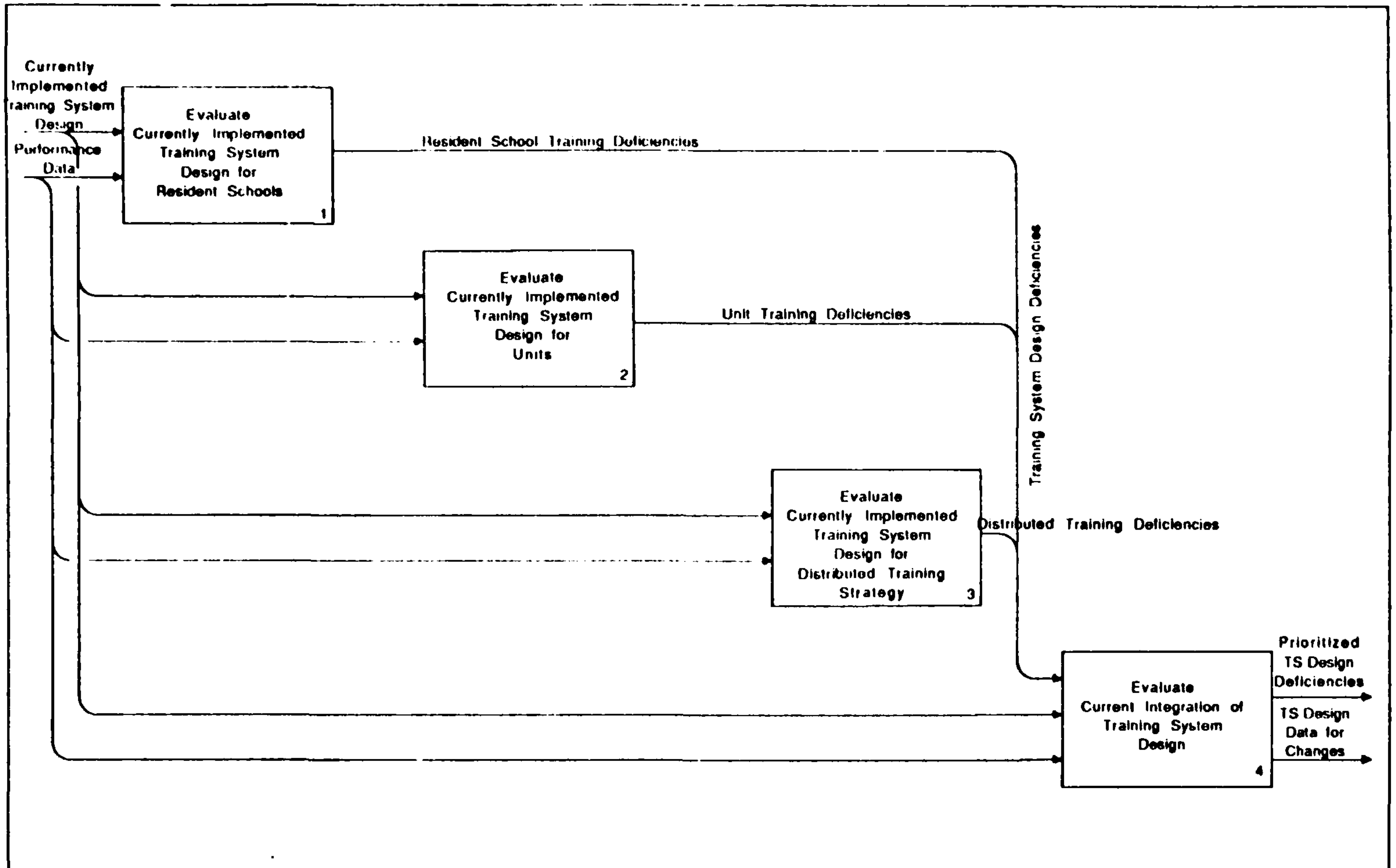
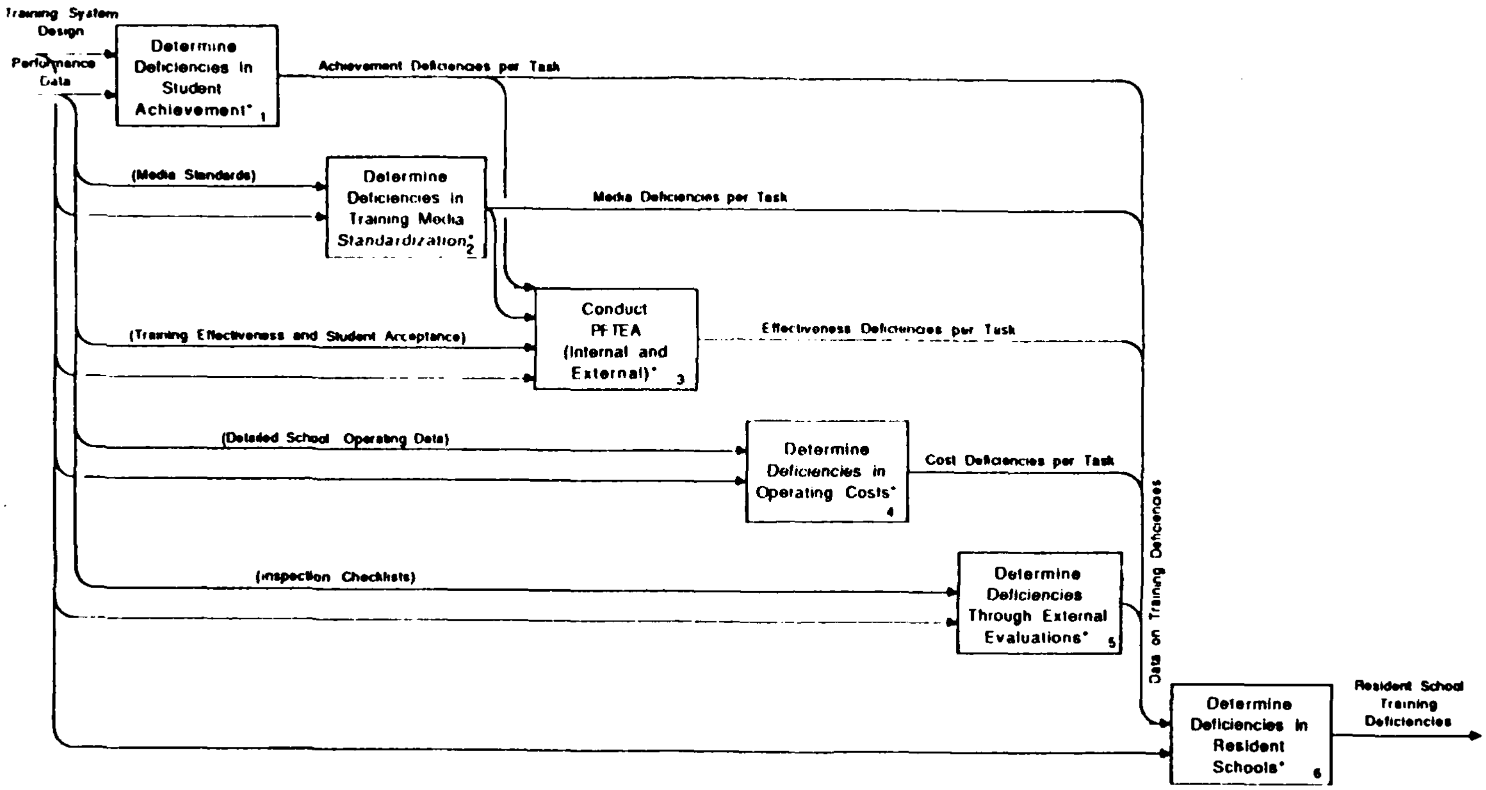


NODE:	TITLE:	NUMBER:
TRASER A042	Evaluate Currently Implemented Training System Design	

TRASER A042 EVALUATE CURRENTLY IMPLEMENTED TRAINING SYSTEM DESIGN

The evaluation of the currently implemented training system, and therefore the evaluation of the design of this system, is divided into three major sets of activities. Included are the evaluation and identification of deficiencies in weapon system training within resident service schools, units, and with distributed training. Each of these areas is evaluated separately. Then, with the deficiencies of each area viewed together, definition of the overall deficiencies of the training system design can be listed and prioritized. This diagram divides the problem into more manageable sized tasks which are discussed in subsequent diagrams.

USED AT: Winter Park	AUTHOR: Braby DATE: 1/3/90 PROJECT: TRASER REV: 1 NOTES: 1 2 3 4 5 6 7 8 9 10	WORKING DRAFT RECOMMENDED PUBLICATION	READER DATE	CONTEXT: A042



NODE: TRASER A0421	TITLE: Evaluate Currently Implemented Training System Design for Resident Schools	NUMBER:

TRASER A0421 EVALUATE CURRENTLY IMPLEMENTED TRAINING SYSTEM DESIGN FOR RESIDENT SCHOOLS

Activities in this diagram are distributed among five major types of evaluations. Student achievement testing is used to measure student learning which could indicate deficiencies in school training. In addition, the structure of course materials can be compared to approved standards, and deficiencies in meeting these standards can be identified. The Post-Fielding Training Effectiveness Analysis type of evaluation can be conducted. Although this form of evaluation can take many forms, it frequently involves the use of questionnaires to assess how well graduates have been prepared to perform the duties assigned on-the-job. Training operating costs are also assessed to determine if the cost of training is excessive, and to consider the costs of alternative ways of conducting required training. Finally, a major means of identifying deficiencies in the weapon system training program is through the normal sequence of inspections and evaluations by teams from the Integrating Centers and from TRADOC Headquarters. Data from all of these forms of evaluations are used in identifying deficiencies in the training system, and therefore deficiencies in the training system design for resident service schools.

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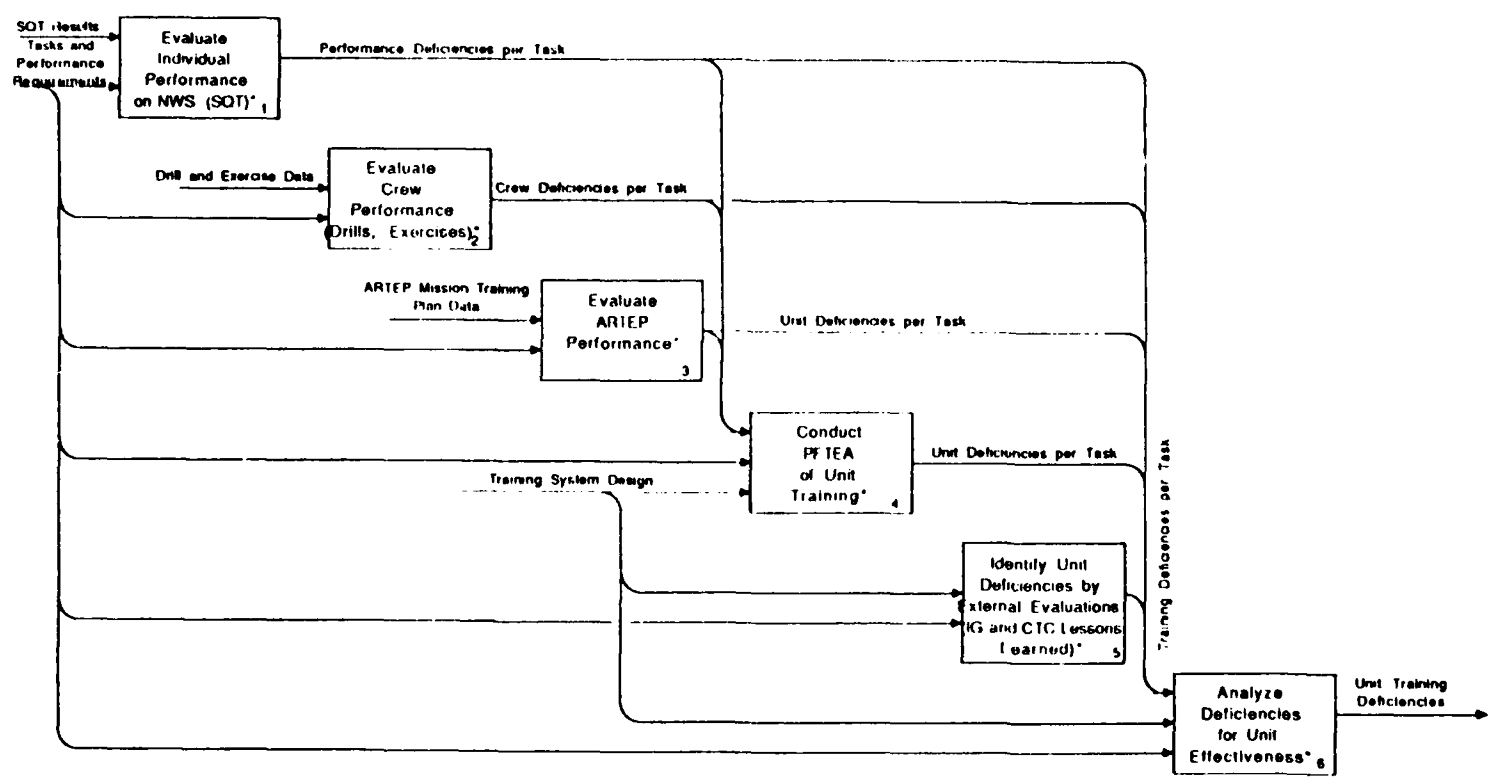

NODE: TRASER A0422	TITLE: Evaluate Currently Implemented Training System Design for Units	NUMBER:

TRASER A0422 EVALUATE CURRENTLY IMPLEMENTED TRAINING SYSTEM DESIGN FOR UNITS

Activities in this diagram are distributed among five major type sof evaluations followed by an analysis of the deficiencies identified in these evaluations. First, is the within unit evaluation of individual soldier performance on weapon system skills. The SQT is one means used, if appropriate. Weapon system crews are evaluated using standard drills, exercises and simulations. The units' performance in carrying out collective tasks is measured with ARTEP exercises. Another from of evaluating training in units is the unit version of the Post-Fielding Training Effectiveness Evaluation. While this evaluation can take many forms, it often involves the use of questionnaires to collect opinions on the suitability of training to provide required skills. Finally, a major means of identifying deficiencies in training programs to teach the employment of weapon systems is through the normal sequence of inspections and evaluations by teams from higher headquarters. Data from all of these forms of evaluation are used in identifying deficiencies in weapon system training in the training system design for units.

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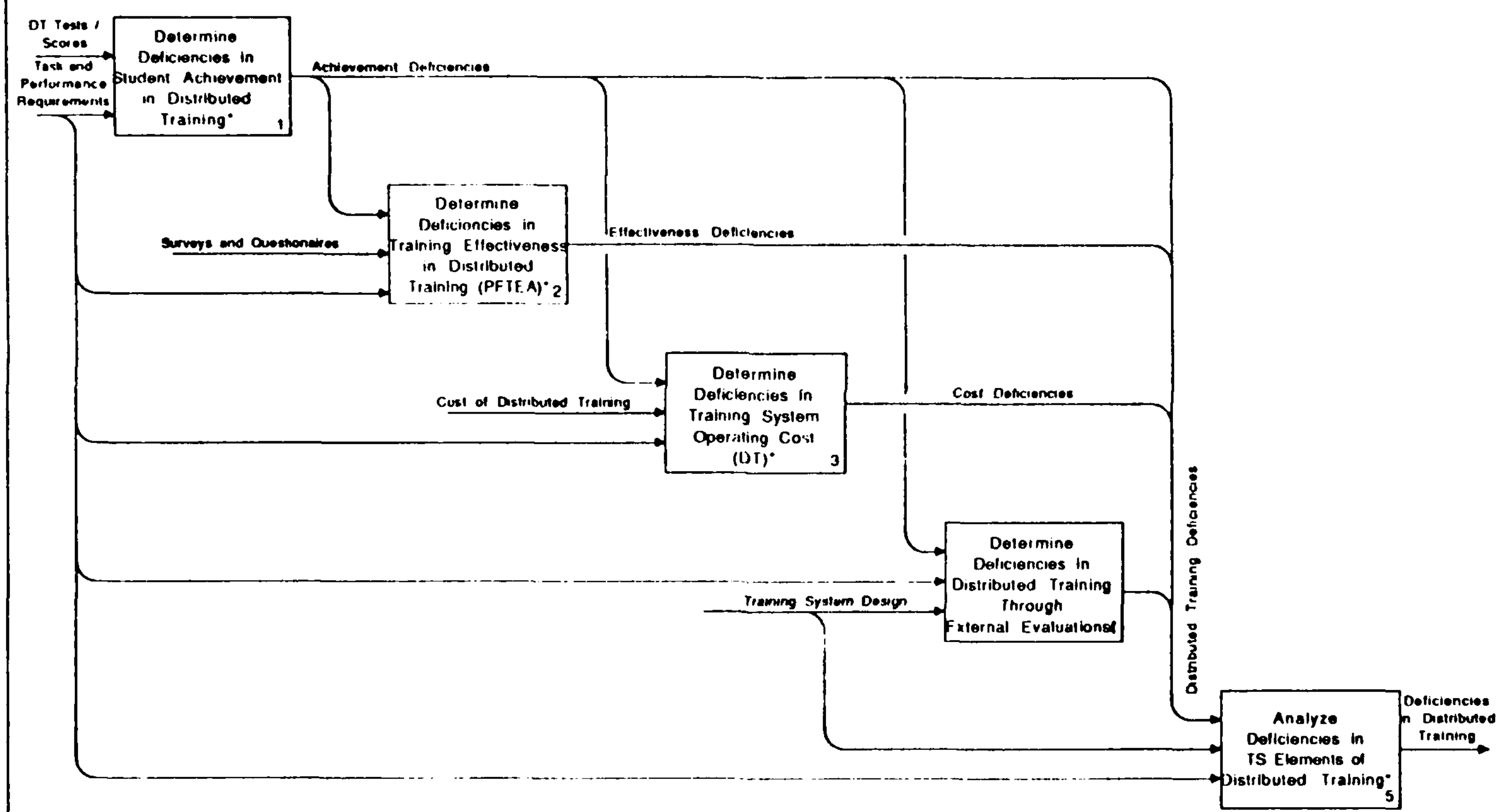

NODE:	TITLE:	NUMBER:
TRASER A0423	Evaluate Currently Implemented Training System Design For Distributed Training Strategy	

TRASER A0423 EVALUATE CURRENTLY IMPLEMENTED TRAINING SYSTEM DESIGN FOR DISTRIBUTED TRAINING STRATEGY

As a new generation of distributed training is developed and fielded, the evaluation of this newly emphasized strategy of instruction will be innovative, the technical approach to performing evaluations will be the traditional methods. Traditional questions must be answered. Given tasks and performance standards, the issues remain as follows. First, are there deficiencies in student achievement while under training? Student academic achievement and hands-on performance can be measured with traditional tests and practical exercises. Second, once on the job, does the trained soldier and do his supervisors consider the graduate to be adequately trained? The typical Post-Fielding Training Effectiveness Analysis (PFTEA) techniques are appropriate. Third, the efficiencies and cost of this method of instructional delivery can also be analyzed in a traditional manner, although cost data on the various forms of distributed training will need to be collected. Fourth, the traditional forms of external evaluation will contribute to an overall understanding of efficiency of this form of training and identify deficiencies in the management of this form of training. Fifth, all forms of evaluation data will be considered in developing a comprehensive and prioritized list of deficiencies in distributed training, the major output of the activities described in this diagram.

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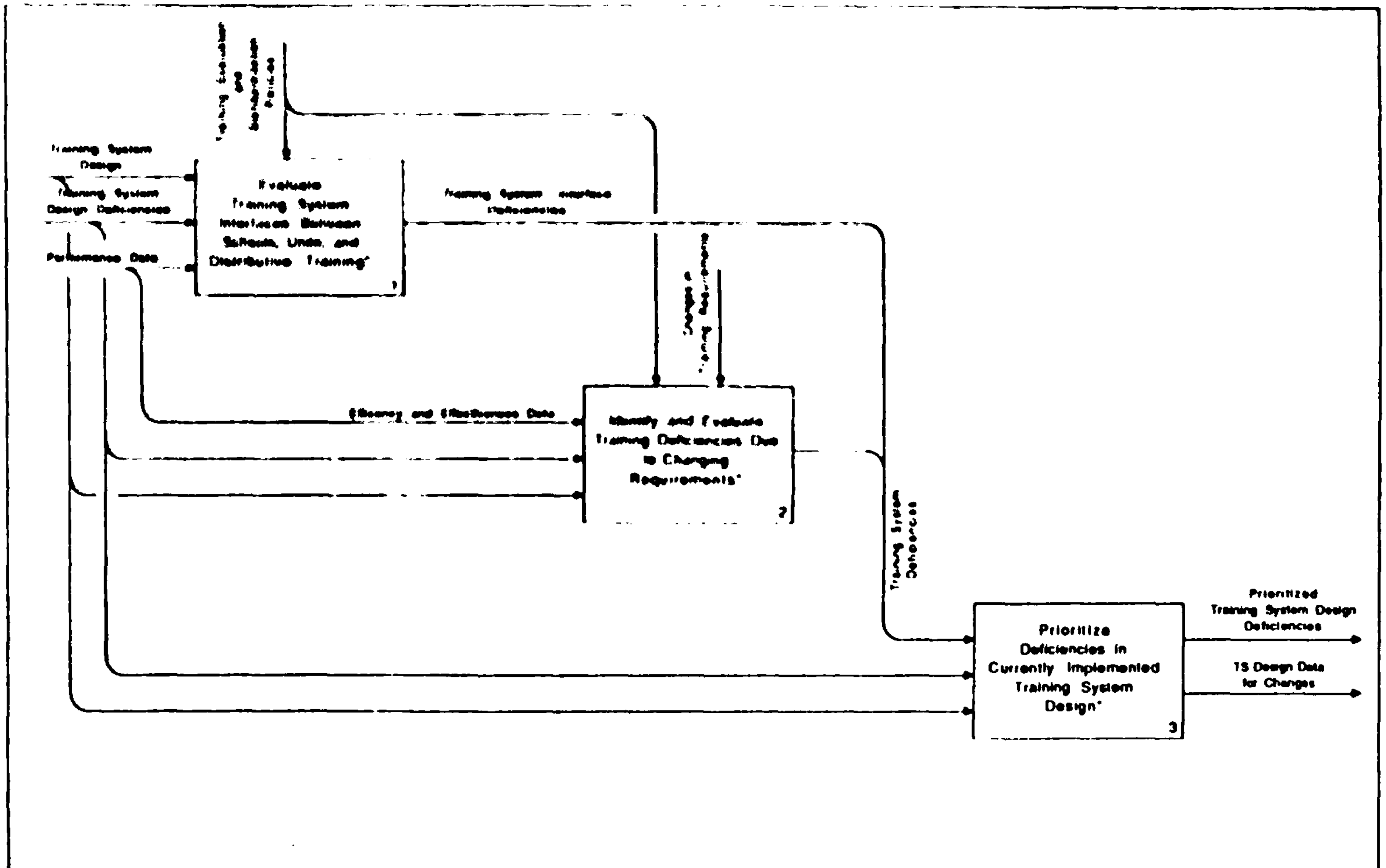
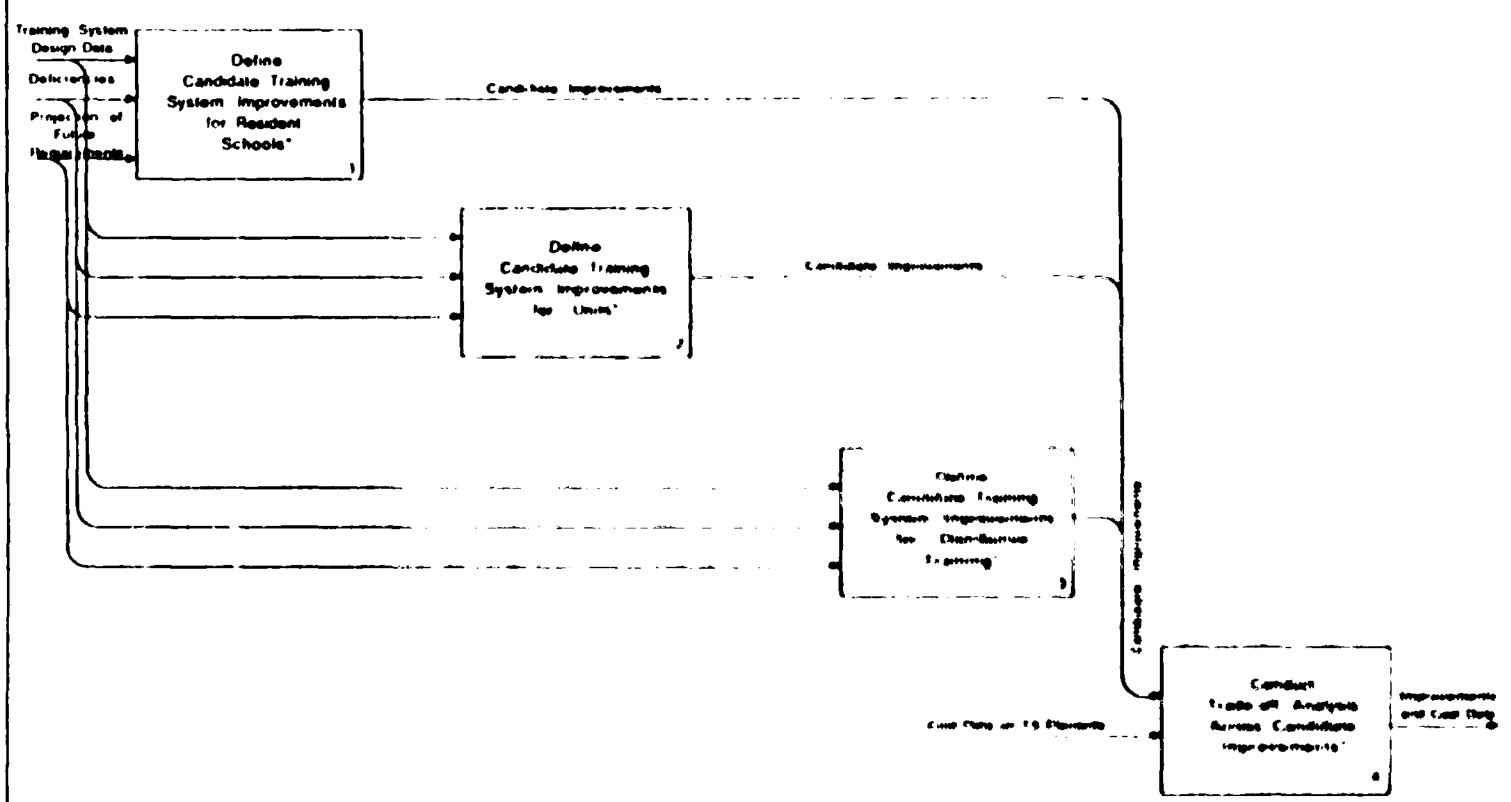


NODE:	TITLE:	NUMBER:
TRASER A0424	Evaluate Current Integration of Training System Design	

TRASER A0424 EVALUATE CURRENT INTEGRATION OF TRAINING SYSTEM DESIGN

Activities in this diagram focus on studying the deficiencies in each of modes of delivering instruction, and the integration of these modes to achieve overall training and soldier performance standards. It looks for requirements that are falling between the "cracks," between existing training programs, or because of changing requirements. These activities include taking the lists of deficiencies form schools, units, and distributive training, and consolidating them into a tentative list of deficiencies. These deficiencies, along with raw data on the cost and effectiveness of the various training programs, data on the training elements actually used in the currently implemented training system, and any change in requirements, are used to determine to what extent personnel can effectively operate, maintain, service and employ the weapon system. The result of this analysis is a list of deficiencies in the currently implemented training system design.

USED AT: Winter Park	AUTHOR: Braby DATE: 1/3/90 PROJECT: TRASER REV: 1 NOTES: 1 2 3 4 5 6 7 8 9 10		WORKING DRAFT RECOMMENDED PUBLICATION	READER DATE	CONTEXT A04



NODE	TITLE	NUMBER
TRASER A043	Define Required Improvements to Training System Design	

TRASER A043 DEFINE REQUIRED IMPROVEMENTS TO TRAINING SYSTEM DESIGN

Based on the list of deficiencies and the currently implemented training system design as well as cost data on the various training system design elements, the activities depicted in this diagram concern defining alternative sets of improvements to the training system design, and conducting trade-off studies leading to the choice of a set of these alternatives. Because of the organizations involved, the process of making these choices is divided into three different activities; one for resident service schools, or expanded distributed training, for example, can be considered. The Directorate of Training and Doctrine of the proponent school, and ATSC make these trade-offs. The output of this activity is a list of required improvements in the training system design, along with cost estimates and actin command.

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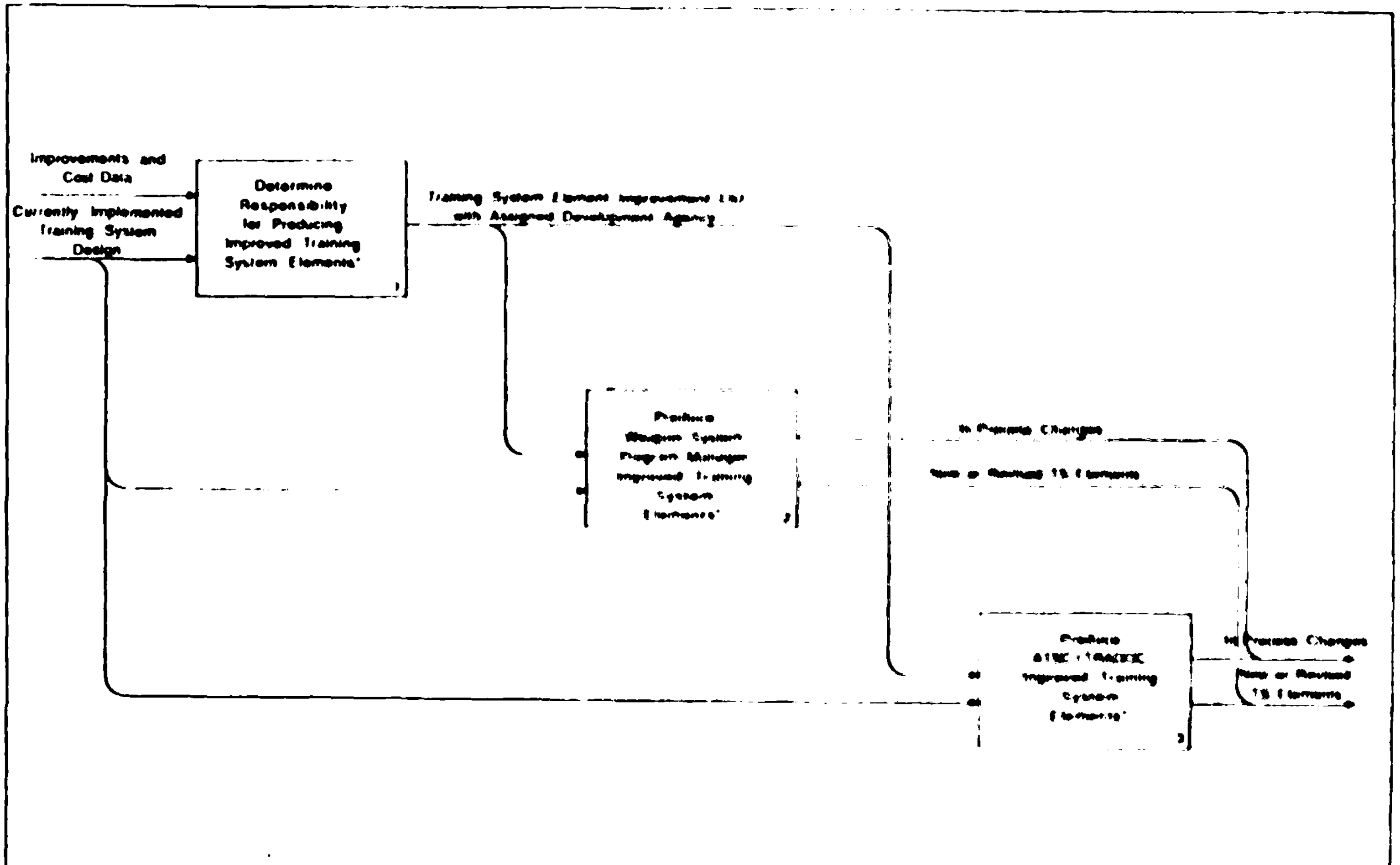
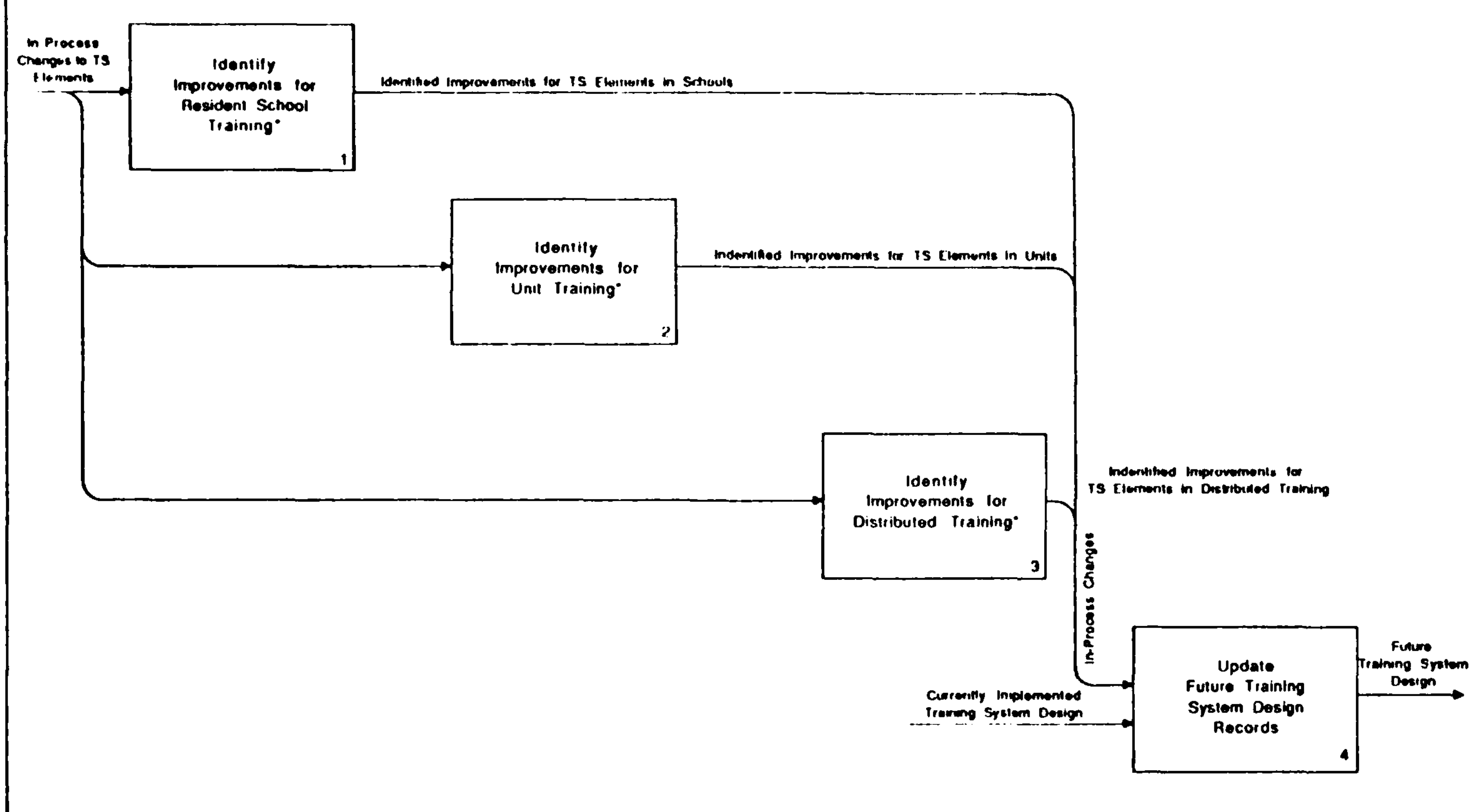


NODE:	TITLE:	NUMBER:
TRASER A044	Produce Training System Elements to Support Required Improvements	

TRASER A044 PRODUCE TRAINING SYSTEM ELEMENTS TO SUPPORT REQUIRED IMPROVEMENTS

Given a set of requirements, the activities in this diagram are of obtaining the specified training system elements, through in-house production, contracting, or rescheduling available resources. One part of this activity is to determine which agencies have the responsibility to provide the elements. Initially the split of responsibility is between the Army Materiel Command (AMC) and TRADOC. In subsequent activities, this tasking and production effort will be more fully identified. This activity is an active one, with the output of this activity, changes completed, and changes in progress, being constantly produced. Due to the everchanging requirements and conditions in weapon system training, it is assumed there will always be required changes that are being prepared and have yet to be implemented.

USED AT: Winter Park	AUTHOR: Braby DATE: 1/3/90 PROJECT: TRASER REV: 1 NOTES: 1 2 3 4 5 6 7 8 9 10	WORKING DRAFT RECOMMENDED PUBLICATION	READER DATE	CONTEXT: A04

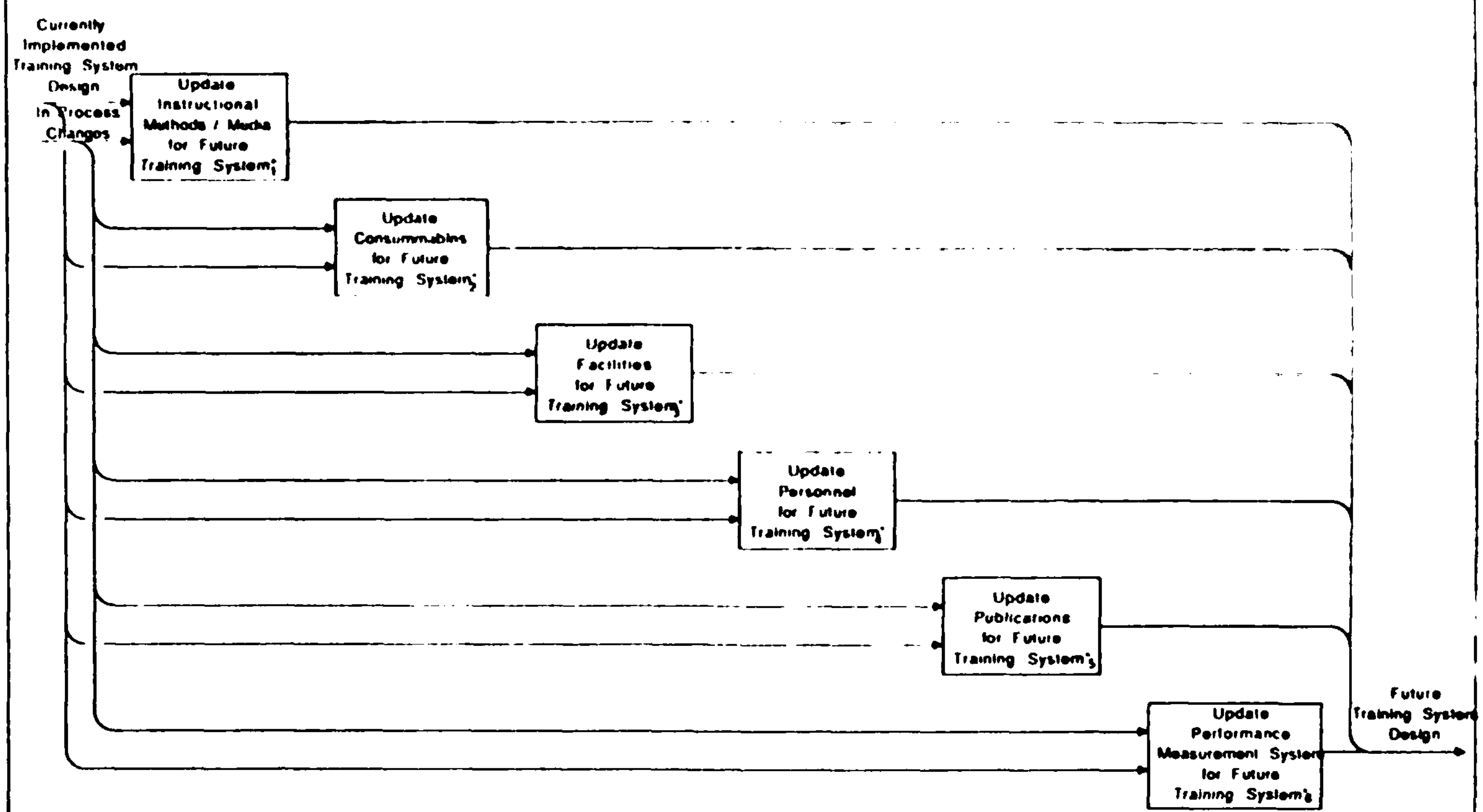


NODE: TRASER A045	TITLE: Update Future Training System Design	NUMBER:

TRASER A045 UPDATE FUTURE TRAINING SYSTEM DESIGN

The purpose of this activity is to update and maintain a Future Training System Design. This is a modification to the Currently Implemented Training System Design and contains data on the resident service schools, course by course, and materials supporting unit training. It also specifies changes being made in the field of distributed training. The Future Training System Design is a record of all changes that are being produced for any part of the training system design supporting training on the operation, maintenance, support or tactical employment of the weapon system. Also, data on the status of these changes should be included. It should be noted that two forms of the training system design are to be maintained following initial implementation for the remainder of the employment of the weapon system. They are: the Currently Implemented Training System Design, and the Future Training System Design. The maintenance of these two designs will support the Systems Approach to Training. It will provide data on the weapon system training resources, present and proposed, and will enable the major supporters of weapon system training to better understand how their contributions fit into the larger training program. It will show how the training is adapting to changing requirements. Additional changes would be initiated in the context of this overall picture of the evolving training system design.

USED AT: Winter Park	AUTHOR: Braby DATE: 1/3/90 PROJECT: TRASER REV: 1 NOTES: 1 2 3 4 5 6 7 8 9 10	WORKING DRAFT RECOMMENDED PUBLICATION	READER DATE	CONTEXT: A045



NODE: TRASER A0454	TITLE: Update Future Training System Design Records	NUMBER:

TRASER A0454 UPDATE FUTURE TRAINING SYSTEM DESIGN RECORDS

The activities in this diagram are the record keeping operation of TRASER. It involves, initially, the modification of the Currently Implemented Training System Design to show the training system design elements that are i the process of being changed. This record is called the Future Training System Design. In subsequent cycles, it is the Future Training Systems Design that is updated. In addition to noting the training system design elements that are being changed, the status of these changes is recorded. As changes are completed and implemented, they become a part of the Currently Implemented Training System Design, as well as baseline elements in the Future Training System Design. While these formal training system designs are not currently in existence, the data they will contain are maintained in records in various training developers' offices.

Appendix E

Training System Design Elements

Appendix E
Training System Design Elements

The first part of this appendix contains the TRASER training system design element taxonomy. The second part contains a definition for each training system design element listed in the taxonomy.

TRAINING SYSTEM DESIGN ELEMENT TAXONOMY

I. INSTRUCTIONAL MEDIA AND METHODS

EQUIPMENT
Operational equipment
Operational equipment with embedded training (ET) capabilities

- Built-in ET
  - On-line mode
  - Off-line mode
  - Single station mode
  - Networked operations mode
- Strap-on ET
  - Off-line mode
  - Single station mode
  - Networked operations mode
- Plug-in ET
  - Off-line mode
  - Single station mode
  - Networked operations mode

Operational equipment modified for training
- Skeletonized version of equipment
- Redesigned version of equipment

Substitute equipment
Equipment components or subsystems
- Unmodified
- Modified for training

Equipment components or subsystems modified for training

<u>DEVICES TO TEACH EQUIPMENT OPERATION AND TACTICS</u>
Simulator
- Combined arms simulator
- Functional area training simulator
- Combat mission simulator
- System simulator
- Part-task simulator

Part-task trainer
- 3D Part-task trainer
- Panel trainer with operator station mock-up
- Panel trainer without operator station mock-up

Familiarization trainer
Interactive courseware for operator training
- Tutorial courseware
- Inquiry courseware
- Drill and practice courseware
- Procedure simulation courseware
- Free play simulation courseware
- Gaming courseware
- Problem analysis courseware
- Modeling courseware
- Socratic dialogue courseware

Training simulations for command and control exercises
- Battle simulations for maneuver-type units
  - Computer supported battle simulations
  - Manual battle simulations
- CS and CSS simulations for nonmaneuver-type units
  - Computer supported CS and CSS simulations
  - Manual CS and CSS simulations

Tactical engagement simulation
- Ground to ground engagement simulation
- Air to ground engagement simulation
- Air defense engagement simulation
- Area weapons effect simulation

<u>DEVICES TO TEACH EQUIPMENT MAINTENANCE</u>

Maintenance trainer
- Composite maintenance trainer
- Subsystem maintenance trainer
- Generic maintenance trainer

Panel trainer
- Panel trainer with operator station mock-up
- Panel trainer without operator station mock-up
- Panel demonstrator

Interactive courseware maintenance trainer
- Tutorial courseware
- Inquiry courseware
- Drill and practice courseware
- Procedure simulation courseware
- Free play simulation courseware
- Problem analysis courseware

<u>INSTRUCTOR AIDS</u>

Computer managed instruction system
Film projection systems
- Transparencies with overhead projector
- Slides with projector
- Motion picture films with projector

Electronic display systems
- Videocassette system
- Videodisc-based computer assisted instruction system
- Television system
- Teleconference system

- Audiotape system
- Computer display projection system

Classroom model
Printed instructor aid
- Flash cards
- Flip charts

STUDENT LEARNING AIDS

Printed student learning aid
- Book
- Handout
- Study card set
- Poster
- Chart
- Paper mock-up
- Map
- Self-scoring exercise
- Programmed text

Electronic display system
- Videocassette system
- Videodisc-based computer assisted instruction system
- Audiotape system

Model
Do-it-yourself kit
Specimen set

PROCESSES FOR ACHIEVING ACADEMIC SKILLS

Case study
Classroom-type practical exercise
Conference (or lecture)
Correspondence course
Electives
Examinations (knowledge)
Film
Guest Speaker
Interactive courseware
Programmed instruction
Seminar
Small group instruction
Teleconference
Television

PROCESSES FOR ACHIEVING PERFORMANCE SKILLS

Demonstrations
Drills
Examinations (performance)
Interactive courseware exercises
Simulator exercises
Tactical engagement simulation exercises
Training exercises
Training simulation exercises
Weapon firing exercises

II. CONSUMABLES

<u>AMMUNITION DESIGNATED FOR TRAINING</u>
Combat ammunition used for training
Training unique ammunition
Field handling trainers
- Dummy cartridges
- Missile handling trainers

<u>BARRIER MATERIAL</u>
<u>POL</u>
<u>SPARE PARTS</u>
<u>TARGET SUPPORT</u>
Target
Target device
Target system

III. FACILITIES

<u>SCHOOL FACILITIES</u>
Classrooms
- lecture hall
- small group instruction classroom
- laboratory

Training bay
Maintenance bay
Administrative office
Resource center
Gym
Student housing
Drill field

<u>RANGES</u>
Combat training center
Gunnery range
Tactical range and maneuvering area
Subcaliber range
Scaled range
Multipurpose range complex
Urbanized terrain range (MOUT)

IV. PERSONNEL

<u>INSTRUCTION</u>
Instructor
Weapon system qualified instructor
Assistant instructor (small group instructor)
Device instructor/operator
Unit trainer
Observer/controller (O/C) cadre

INSTRUCTIONAL SUPPORT PERSONNEL
Maintainer
Ammunition handler
POL handlers
Opposing force (OPFOR) cadre
Learning center staff member
Instructional material developer
- Education specialist
- Training specialist
- Subject matter specialist
- Test and measurement specialist
- Visual information specialist
- Illustrator
- Writer/editor
- Word processor
- Phototypesetter
- Photographer/cameraman
- Actor
- Script director
- Computer programmer

ADMINISTRATIVE PERSONNEL
Training administrator
Clerk

V. PUBLICATIONS

ARMYWIDE TRAINING LITERATURE
Field Manual (FM)
Training Circular (TC)
Soldier Training Publications (STP)
- Soldier's Manual and Trainer's Guide
- Job Book

Military Qualifications Standards (MQS)
Army Training and Evaluation Program (ARTEP)
- Mission Training Plans
- Drill Book

Reserve Officers Training Corps Manual (ROTCM)

DOCTRINAL LITERATURE
Field Manual (FM)
Training Circular (TC)
Joint publication
Multiservice publication
Field Circular
TRADOC 525 Series Pamphlet
Battle report

INDIVIDUAL TRAINING EVALUATION PROGRAM (ITEP) PUBLICATIONS
Skills Qualification Test (SQT)
Common Tasks Test (CTT)
Commander's Evaluation

CURRICULUM DOCUMENTS
Lesson Plan
Practice Exercise
Performance tests and written tests
- lesson/module test
- end of course test
- diagnostic test

TECHNICAL MANUALS
Operator's manuals
Maintenance manuals
Repair parts and special tools lists

TRAINING MANAGEMENT DOCUMENTS (examples only)
System Training Plan (STRAP)
New Equipment Training Plan (NETP)
Individual Training Plan (ITP)
Course Administrative Data (CAD)
Program of Instruction (POI)

EXTENSION TRAINING DOCUMENTS
Army Correspondence Course
Reserve Reconfigured Course

UNIT DOCUMENTS
Unit Standard Operating Procedures (SOP)
Unit Training Standard Operating Procedures
Rules of Engagement (ROE) for training exercises

VI. PERFORMANCE MEASUREMENT SYSTEMS

PERFORMANCE MEASUREMENT CONDUCTED IN INSTITUTIONS
Academic tests
Student interview
Instructor interview
Evaluator observations
Performance-oriented test
Simulated performance test
Performance test

PERFORMANCE MEASUREMENT CONDUCTED IN UNITS
Skill Qualification Test (SQT)
Combat Training Center CTC) exercise
Common task test (CTT)
Drill
Embedded training
Emergency Deployment Readiness Exercise (EDRE)
Mission training plan exercise (ARTEP)
Weapon firing exercise
Tactical engagement simulations (TES)
Training exercises

- Map exercise (MAPEX)
- Tactical Exercise Without Troops (TEWT)
- Command Post Exercise (CPX)
- Field Training Exercise (FTX)
- Command Field Exercise (CFX)
- Live Fire Exercise (LFX)
- Fire Coordination Exercise (FCX)
- Joint Training Exercise (JTX)
- Force-On-Force Exercise (FOF)
- Situational training exercise
- Training exercise data collection
    - data collection
    - manual data collection

Training simulations for command and control exercises

- Battle simulations for maneuver-type units
    - Computer supported battle simulations
    - Manual battle simulations
- CS and CSS simulations for nonmaneuver-type units
    - Computer supported CS and CSS simulations
    - Manual CS and CSS simulations

Simulator exercise

Small arms firing exercise

The remainder of this appendix contains definitions of each of the elements in the training system design element taxonomy.

I. INSTRUCTIONAL MEDIA AND METHODS

EQUIPMENT

OPERATIONAL EQUIPMENT: Combat and other equipment, not configured in any special way for use in training.

OPERATIONAL EQUIPMENT WITH EMBEDDED TRAINING (ET) CAPABILITIES: An end item equipment which has features incorporated into or added onto it to provide training and practice using the end item of equipment. The features must include stimuli necessary to support training, and should include performance assessment capability, appropriate feedback, and record keeping. ET capabilities can be to support the training of individual operators and maintainers, crews, functional teams, or force level commanders and battle staffs. In each of these capabilities, ET can be used in the acquisition, practice and sustainment of part-task, full-task, and mission performance. Its various forms include:

- BUILT-IN ET: A form of ET in which the training support features are completely embedded within the system configuration and are invoked by software applications. Variations of built-in ET include:

  - On-line: ET components which can operate when the system is in operational status. An example would be administering target identification, tracking, or maneuver training during normal flight operations. Note: The decision to proceed with fully on-line ET needs to consider the system safety and security implications.

  - Off-line mode: ET components which can operate on the operational equipment only when the system is rendered combat incapable. This may be achieved through something as simple as a flip of a switch and a few seconds of transition time.

  - Single station mode: ET which operates within the bounds of a single operational station for individual training.

  - Networked operations mode: ET which employs electronic networks, either part of the operational networks or networks dedicated to ET, to link multiple crew members or members of the functional or force level staffs during combined arms training. Note: AI may be employed to create surrogate crew members and combined arms components.

- STRAP-ON ET: A form of ET in which training stimuli are generated through external equipment, and administered using the operational equipment. The ET-specific devices are electronically connected to the operational equipment, and are not present during normal operational use. The strap-on devices could range from an interactive videodisc player and controller to a separate computer interfaced to the operational soldier machine interface. Many of the devices used a Combat Training Centers to simulate weapon firing and these are examples of strap-on ET.
  - Off-line mode: (see above)
  - Single station mode: (see above)
  - Networked operations mode: (see above)

- PLUG-IN ET: A form of ET which obtains directions or stimuli for training from separate, and removable training-only media, such as floppy disks, CD-ROM discs, or videodiscs.
  - Off-line mode: (see above)
  - Single station mode: (see above)
  - Networked operations mode: (see above)

<u>OPERATIONAL EQUIPMENT MODIFIED FOR TRAINING</u>: End item equipment that has had parts removed or components added or modified to better support specific phases of operator or maintenance training.

- SKELETONIZED VERSION OF EQUIPMENT: A version of the equipment in which certain subsystems or components have been removed to adapt the equipment to be used in a training program; i.e., an aircraft without weapons system components to be used in flight training.

- REDESIGNED VERSION OF EQUIPMENT: A version of the equipment in which new features have been added to support a training program; i.e., a two seat version of what is normally a single seat aircraft, to accommodate an instructor pilot.

<u>SUBSTITUTE EQUIPMENT</u>: A lower cost piece of equipment used as a replacement for a higher cost weapon system in phases of training where this substitution results in both adequate training and lower costs; i.e., training aircraft.

<u>EQUIPMENT COMPONENTS OR SUBSYSTEMS</u>: Operational subsystems of a system, not installed in the larger system, used for training without being modified for training.

- UNMODIFIED: Equipment components or subsystems used for training without being modified for training.

- MODIFIED FOR TRAINING: Subsystems of a system, not installed in the larger system but stimulated as necessary to function independently, for use in operation or maintenance training.

DEVICES TO TEACH EQUIPMENT OPERATION AND TACTICS

SIMULATOR: When used in a training context, refers to a dynamic replica of an operational system and its operating environment. The appearance and behavior of the replica must appear realistic to the degree needed for the intended training tasks, with the behavior of the replica being controlled by a computer in such a way that a student can conduct free-play practice of an operation usually in real time and receive realistic cues and responses from the replica.

- COMBINED ARMS SIMULATOR: A simulator or network of simulators that support collective training on missions that require the joint action of teams using weapon systems from two or more proponencies; i.e., aviation and armor.

- FUNCTIONAL AREA TRAINING SIMULATOR: A network of simulators that support training on the tactical use of two or more similar weapon systems.

- COMBAT MISSION SIMULATOR: An independent simulator of a weapon system that supports an individual crew (one position or multi-positions) in practicing the combat employment of a single weapon system.

- SYSTEM SIMULATOR: A simulator of an equipment system that supports an individual or crew (one position or multi-positions) in practicing the normal and emergency procedures and operations of the equipment as an engineering system, not the combat employment of the system against a tactically maneuvering enemy threat; i.e., a flight simulator.

- PART TASK SIMULATOR: A simulator of one or more pieces of equipment from the larger set of equipments that make up the single operator's position (i.e., the soldier can practice part, but not all, of the functions of the operator's position).

PART-TASK TRAINER: A hands-on training device without the realtime performance of a simulator, that supports instruction and initial practice on a major component of a job-task that can be practiced separately from other tasks, and without free-play modeling of system performance, i.e., a device for performing operator checklists such as a preflight checklist.

- 3D PART-TASK TRAINER: A form of part-task trainer in which a student can be tutored in performing the steps of a procedure (i.e., a linear sequence of actions, each action requiring the locating of components, and the observation or manipulation of the components). It is a full-sized replica of the equipment, but real time performance is generally not required or supported.

- PANEL TRAINER WITH OPERATOR STATION MOCK-UP: Portable panel type classroom displays in which graphic or operational components are used to depict the functioning of a subsystem, with an integrated mock-up containing the hands-on controls used to manage the operational subsystem. This type device is used by instructors in teaching and students in learning system theory, procedures for normal and abnormal operation, and operator type fault isolation and repair.

- PANEL TRAINER WITHOUT OPERATOR STATION MOCK-UP: Portable panel type classroom displays in which graphic or operational components are used to depict the operation of a subsystem. This type of device is used by instructors in teaching system theory, procedures for normal and abnormal operation, and operator type fault isolation and repair.

<u>FAMILIARIZATION TRAINER</u>: A form of low cost mock-up device used by students to learn the location and appearance of the components of a system, and to learn to talk their way through procedures before practicing these procedures on more expensive training assets.

<u>INTERACTIVE COURSEWARE FOR OPERATOR TRAINING</u>: A form of trainer that uses a computer, or computer and videodisc, as the primary means of delivering instruction and processing student responses. Information is presented on the computer display, and the student interacts with the display using any of the standard computer input devices; (i.e., keyboard, light pen, touch screen, mouse, joy stick, voice, etc.). This medium supports a broad range of training goals. It is the instructional strategy of the courseware that shapes the application of TUTORIAL COURSEWARE: A form of courseware that teaches new behavior by dividing the new behavior into small steps, then presents a step, requires a response, gives feedback, remediates errors and requires the correct response before proceeding.

- INQUIRY COURSEWARE: A form of courseware that allows the student to search for information at his own speed and in his own way, such as recalling previously learned information for use in solving a problem or in checking ones prerequisite skills before launching into a new lesson.

- DRILL AND PRACTICE COURSEWARE: A form of courseware that provides repetitive trials in performing previously learned behavior, and is generally used in practicing the recall of factual type information.

- PROCEDURE SIMULATION COURSEWARE: A form of courseware that can be used by a student to first learn and then practice performing specific procedures on a graphic model of a piece of equipment, with the model displaying appropriate feedback for correct and incorrect student performance. The student proceeds to the next step in the procedure only after performing the last step correctly. Only programmed procedures can be performed, and they must be performed in the prescribed manner.

- FREE PLAY SIMULATION COURSEWARE: A form of courseware based on the mathematical modeling of the performance of a piece of equipment, supporting a student's practice in performing operations on a graphic model of the equipment. This type of simulation is not limited to a prescribed set of procedures.

- GAMING COURSEWARE: A form of courseware that is a contest in which the students plays against the computer or another student, according to a formal set of rules, with the objective of winning. In showdown games, students attempts to give their best performance without interface or interaction from other students. Scores are then compared to determine the winner. In strategy games, the students interact or interfere with each other's performance in their attempts to win.

- PROBLEM ANALYSIS COURSEWARE: A form of courseware that requires students to formulate general solutions to complex problems, not actual answers. The student seeks the logic behind the solution rather than the facts or calculations required.

- MODELING COURSEWARE: A form of courseware based on the mathematical or expert rule-based modeling of phenomena, other than the performance of a piece of equipment, supporting a student's manipulation of the model to investigate its behavior or characteristics (e.g., the student can draw sample data from simulated data on a complete population of people, analyze these data using various statistical techniques, and then compare the results with the true characteristics of the population).

- SOCRATIC DIALOGUE COURSEWARE: A form of courseware in which the student and computer use natural language to converse. In addition, the program states questions and responds to student responses, and guides the student in the investigation of a body of knowledge.

TRAINING SIMULATIONS FOR COMMAND AND CONTROL EXERCISES: A generic term for simulated war game type exercises through which command and staff elements are trained and rehearsed for the command and control of wartime missions. Two major types of exercises are:

- BATTLE SIMULATIONS FOR MANEUVER-TYPE UNITS: Training simulations for the command and control of combat units in wartime missions. These can be manual or computer supported exercises.

- CS AND CSS SIMULATIONS FOR NONMANEUVER-TYPE UNITS: Training simulations for the command and control of combat support or combat service support units in wartime missions. These can be manual or computer supported exercises.

TACTICAL ENGAGEMENT SIMULATION: A generic term for techniques and equipment designed to simulate realistically the lethality and casualty-producing effects of modern weapons in two-sided, free-play tactical training exercises. The exercises are conducted with operational equipment used with strap-on or built-in packages to simulate gunfire, to detect hits and to create the smoke, flash and sound of battle. Major types of tactical engagement simulation equipment include:

- GROUND TO GROUND ENGAGEMENT SIMULATIONS: Strap-on or built-in packages used with infantry, artillery and armor weapons to simulate the effect of their weapons and to disclose their location via smoke, flash and sound. It also includes the instrumentation added to soldiers and to vehicles to detect when they are hit by an aggressor.

- AIR TO GROUND ENGAGEMENT SIMULATIONS: Strap-on or build-in packages used with aircraft to simulate the effect of the aircraft's weapons. It includes the instrumentation added to soldiers and vehicles to detect when they are hit by the aircraft's weapons.

- AIR DEFENSE ENGAGEMENT SIMULATIONS: Strap-on or built-in packages used with air defense weapons to simulate the effect of the weapons against aircraft. It includes the instrumentation added to the aircraft to detect hits by the air defense weapons.

- AREA WEAPONS EFFECT SIMULATIONS: Simulation packages used in Tactical Engagement Simulation exercises to input the lethal effects of mines, NBC agents, artillery and mortars on soldiers and vehicles.

DEVICES TO TEACH EQUIPMENT MAINTENANCE

MAINTENANCE TRAINER: A piece of stand-alone equipment, other than the operational system, which supports a technician in practicing the maintenance tasks to be performed on an operational system. The types of maintenance trainers are:

- COMPOSITE MAINTENANCE TRAINER: Two or more operating subsystems of an operational system built into a compact replica of the operational system in such a way that the components are visible, readily accessible and support a student in practicing troubleshooting and repair operations.

- SUBSYSTEM MAINTENANCE TRAINER: Components of one subsystem of an operational system presented as a piece of equipment to support a student in practicing troubleshooting and repair operations on that subsystem.

- GENERIC MAINTENANCE TRAINER: A functioning system (such as a radar system) designed for maintenance training, containing the typical subsystem generally found in operational equipment of that class, but the components are ruggedized for frequent use by students, there is easy access to the components, and the system is safer than operational systems for use by students.

PANEL TRAINER: Portable panel type classroom display in which graphic or operational components are used to depict the functioning of a subsystem, with or without an integrated mock-ups containing the hands-on controls of the operational system. Various types of panel trainers include:

- PANEL TRAINER WITH OPERATOR STATION MOCK-UP: Portable panel type classroom displays in which graphic or operational components are used to depict the functioning of a subsystem, with an integrated mock-up containing the hands-on controls used to manage the operational subsystem. This type device is used by instructors in teaching and students in learning system theory, procedures for normal and abnormal operation, isolating malfunctions, and making proper adjustments or alignments.

- PANEL TRAINER WITHOUT OPERATOR STATION MOCK-UP: Portable panel type classroom displays in which graphic or operational components are used to depict the functioning of a subsystem. This type of device is used by instructors in teaching system theory, procedures for normal and abnormal operation, isolating malfunctions, and making proper adjustments or alignments.

- PANEL DEMONSTRATOR: Portable panel type classroom displays in which graphic or operational components are used to depict the normal functioning of a system or subsystems. It

is used by an instructor to teach system theory, but lacks the capability to support troubleshooting.

INTERACTIVE COURSEWARE MAINTENANCE TRAINER: A form of maintenance trainer that uses a computer, or computer and videodisc, as the primary means of delivering instruction and processing student responses. Information is presented on the computer display, and the student interacts with the display using any of the standard computer input devices; (i.e., keyboard, light pen, touch screen, mouse, joy stick, voice, etc.) This medium supports a broad range of training goals. It is the instructional strategy of the courseware that shapes the application of this type of trainer. Instructional strategies appropriate for maintenance training include:

- TUTORIAL COURSEWARE: A form of courseware that teaches new behavior by dividing the new behavior into small steps, then presents a step, requires a response, gives feedback, remediates errors and requires the correct response before proceeding.

- INQUIRY COURSEWARE: A form of courseware that allows the student to search for information at his own speed and in his own way, such as recalling previously learned information for use in solving a problem or in checking prerequisite skills before launching into a new lesson.

- DRILL AND PRACTICE COURSEWARE: A form of courseware that provides repetitive trials in performing previously learned behavior, and is generally used in practicing the recall of factual type information.

- PROCEDURE SIMULATION COURSEWARE: A form of courseware that can be used by a student to first learn and then practice performing specific procedures on a graphic model of a piece of equipment, with the model displaying appropriate feedback for correct and incorrect student performance. The student proceeds to the next step in the procedure only after performing the last step correctly. Only programmed procedures can be performed, and they must be performed in the prescribed manner.

- FREE PLAY SIMULATION COURSEWARE: A form of courseware based on the mathematical modeling of the performance of a piece of equipment, supporting a student's practice in performing operations on a graphic model of the equipment. This type of simulation is not limited to a prescribed set of procedures.

- PROBLEM ANALYSIS COURSEWARE: A form of courseware that requires students to formulate general solutions to complex problems, not actual answers. The student seeks the logic

behind the solution rather than the facts or calculations required.

INSTRUCTOR AIDS

COMPUTER MANAGED INSTRUCTION SYSTEM: A computer with related software designed to assist an instructor in managing a training program, including student registration, pretesting, diagnostic counseling, progress testing, directing students to off-line learning modules suited to their needs, posttesting, disenrollment, and upon request, presenting to the instructor that information requested on a student's status.

FILM PROJECTION SYSTEM: Film-based material designed to be used by an instructor and to be presented on a large screen in the front of a classroom, including the equipment necessary to present these materials. Film-based projection systems include:

- TRANSPARENCIES WITH OVERHEAD PROJECTOR: A projection system utilizing large transparencies (usually 8.5"x11") that are placed on a horizontal stage of a projector and projected onto a screen with adequate brilliance so that the room need not be darkened.

- SLIDES WITH PROJECTOR: A projection system utilizing small transparencies (usually 35mm slides) that are contained in a tray and projected onto the screen with a level of brilliance requiring the room to be semi-dark. A variation of this medium uses an audio tape narration with signals that automatically advance the slides.

- MOTION PICTURE FILMS WITH PROJECTOR: A projection system in which a sequence of small transparencies (usually 16mm film) are projected onto the screen in a dark room giving the illusion of motion with synchronized sound.

ELECTRONIC DISPLAY SYSTEM: Electronic media with supporting display equipment to be used by an instructor for presenting video and/or audio program materials. At this time the following systems are included:

- VIDEOCASSETTE SYSTEM: A display system consisting of videotape programs in cassettes, a videocassette player, and a television set. The videotape is usually programmed and used as a linearly formatted material, i.e., you start at the beginning, and play to the end without stopping or branching. Although it can be used in other ways, the equipment as presently structured does not readily support other formats.

- VIDEODISC-BASED COMPUTER ASSISTED INSTRUCTION SYSTEM: A television information delivery system in which the message is stored on an optical disc. The use of the videodisc sequènseinfaemedtuhoia whasbrobm ófsstudentscandprasenhoase the material and the order that these materials are presented.

- TELEVISION SYSTEM: A broad range of technologies including broadcast, cable and closed-circuit transmissions of live or recorded programs of audiovisual content in a linear format without feedback from participants.

- TELECONFERENCE SYSTEM: A television system modified to include student participation in the form of two-way communication between students located at remote sites and those conducting the program.

- AUDIOTAPE SYSTEM: A system that uses a tape recorder or reproducer to record sound on a magnetic tape which can be played back under the control of the listener. The audio tape program is usually formatted to be heard from beginning to end, however, it can be stopped and started with ease and replayed as necessary.

- COMPUTER DISPLAY PROJECTION SYSTEM: A system for projecting a sequence of static or animated computer displays onto a large screen for use in demonstrating a software package or as visuals to support a briefing or lecture.

<u>CLASSROOM MODEL</u>: A class of three-dimensional training aids representing operational equipment or other objects used by an instructor to present information. Forms may include full size or scaled representations, solid or cutaway views, with or without moving parts or a capability to be disassembled, and representations of terrain.

<u>PRINTED INSTRUCTOR AID</u>: A class of two-dimensional paper-based training aids used by an instructor to present information. Typical forms include flash cards and flip charts that may employ both graphics and text, and can be produced centrally or locally.

- FLASH CARDS: A set of cards designed to be used by an instructor in front of group of students to drill the group in the recall of memory type information.

- FLIP CHARTS: A set of paper charts of a size that can be read by all the students in a classroom, mounted on an easel so that an instructor can flip to the required chart to support the presentation of information to the class.

STUDENT LEARNING AIDS

PRINTED STUDENT LEARNING AID: A type of paper documents used by the student during classroom instruction or independent study, including handouts, study card sets, posters, and self-scoring exercise.

- BOOK: A bound paper document.
- HANDOUT: Printed information on a specific topic supplementing information in a technical manual or textbook.
- STUDY CARD SET: A deck of playing cards with questions on one side and answers on the other, or information to be memorized.
- POSTER: A printed message that attracts the student's attention and presents significant information on safety, security or similar topics, designed to be placed on a bulletin board and other locations with a high flow of student traffic.
- CHART: A flow chart, wiring diagram or other symbolic and functional representation of a system or subsystem.
- PAPER MOCK-UP: A pictoral representation of the operator's or maintainer's views of a piece of equipment, showing all the features that must be located and identified to perform supported operations.
- MAPS: A symbolic drawing of all or some part of the earth's surface.
- SELF-SCORING EXERCISE: A paper-based quiz that is designed to provide the student with immediate feedback following each answer through the use of mark sense techniques such as scratching though a layer of ink or wiping a chemically treated felt pen over a zone to expose a permanently scored response to a question.
- PROGRAMMED TEXT: A form of printed material that presents frames of information and multiple-choice or completion type questions, organized in such a way that the student's response is immediately evaluated and the student is then directed to the next appropriate frame of information. The material is carefully sequenced, tested, and revised to ensure that a specific student population will achieve stated behavioral objectives with a predetermined level of success.

ELECTRONIC DISPLAY SYSTEM: A means of delivering instruction via electronically generated displays.

- VIDEOCASSETTE SYSTEM: A television information delivery system in which the message is stored on videotape contained in a cartridge or cassette. The use of videotape results in a medium in which the student views a linear sequence of events on the television screen. Student practice in the recall, application and testing of new knowledge is done outside of the videocassette system.

- VIDEODISC-BASED COMPUTER ASSISTED INSTRUCTION SYSTEM: An instructional system consisting of videodiscs, a videodisc player, a microcomputer, software, and a computer monitor. When the program on the videodisc is for training purposes, it is usually formatted with numerous branching video and audio subroutines, and is played making maximum use of the branching capability.

- AUDIOTAPE SYSTEM: An information delivery system in which the message is stored on audio tape. The use of the audiotape results in a medium in which the student listens to a linear message recorded on the tape.

MODEL: A scaled and simplified replica of a real object designed to be used by individual students. It can be a reduction, enlargement, or the same size as the original, and may incorporate such characteristics as cut-a-way sections, take-a-part components, labels and color coding, and moving components.

DO-IT-YOURSELF KIT: A type of instructional kit containing instructions and
materials for fabricating a product. Such a kit offers practical "hands-on"
training following theoretical training.

SPECIMEN SET: A set of sample items to be recognized, classified, evaluated or tested.

PROCESSES FOR ACHIEVING ACADEMIC SKILLS

CASE STUDY: A group situation where the group is presented with a description of, and the requirements to reach solutions to, a complex real-life problem.
Material is usually in printed form, but can be presented orally or though role- playing, films, and television.

CLASSROOM-TYPE PRACTICAL EXERCISE: A practical application, performed under
controlled conditions by the student as specified in the lesson objectives; all student performance in the classroom area, except that involving practice in the use of specific equipment items.

CONFERENCE (OR LECTURE): A method which employs directed discussion of a topic involving group participation that is student-centered but instructor-controlled.

CORRESPONDENCE COURSE: A self-study course consisting of structured units of information, assigned exercises for practice, and examinations to measure achievement for administration to nonresident students.

ELECTIVES: A program of instruction which is used to provide students with the option of increasing their depth of knowledge in selected areas or to pursue study according to their own personal and professional military needs. (Only authorized for Command and General Staff College and those electives at other schools which are presented by regularly assigned instructor personnel.)

EXAMINATION (KNOWLEDGE): All student testing in the classroom area, except testing that requires the use of specific equipment items.

FILM: A method which involves the use of a film, shown for its own sake, not in conjunction with other methods of instruction.

GUEST SPEAKER: An individual, other than a member of the staff and faculty, who is invited by the school to lecture to students on a specific subject.

INTERACTIVE COURSEWARE: All forms of training programs delivering academic type instruction on a computer as computer assisted instruction.

PROGRAMMED INSTRUCTION: An instructional method in which learning objectives and elements are sequenced in steps presented in a stimulus and response structure with immediate feedback for reinforcement. The medium of instruction may be printed material, audio-visual material or a combination of printed and audio-visual material.

SEMINAR: A tutorial arrangement, involving the instructor and the group, designed to elicit and exchange substantive information for such purposes as reaching new solutions to problems, providing general guidance for a group working on an advanced study or research project, and exchanging information on techniques and approaches being explored by members of a study or research group.

SMALL GROUP INSTRUCTION: Discussion groups in which each student has the opportunity to express his understanding, concerns, attitudes and need for help in mastering the objectives of a course of study. This form of instruction is especially useful when attitudes are central to the course objectives as in topics

such as substance abuse, safety, race relations, sexual harassment, employee productivity and leadership.

TELECONFERENCE: A conference conducted with telecommunication equipment in such a way that two way communication is maintained between the remotely located participants.

TELEVISION: A method which involves the use of television programming for its own sake, not in conjunction with other types of methods.

PROCESSES FOR ACHIEVING PERFORMANCE SKILLS

DEMONSTRATIONS: The use of an actual situation or a portrayal used to show and explain a procedure, technique, or operation; usually combining oral explanation with operation or handling of systems, equipment, or materials.

DRILLS: All forms of disciplined, repetitious exercises to teach and perfect a skill or procedure.

EXAMINATIONS (PERFORMANCE): Formal evaluations of a student's or crew's achievement of specific learning objectives, often related to the operation, maintenance, and tactical employment of a weapon or weapon system.

INTERACTIVE COURSEWARE EXERCISES: All forms of training programs supporting practice on the operation, maintenance and employment of equipment.

SIMULATOR EXERCISES: All forms of instruction and practice performed on any type of training simulator.

TACTICAL ENGAGEMENT SIMULATION EXERCISES: All forms of force on force exercises conducted with operational equipment used with strap-on or built-in packages to simulate the lethality and casualty-producing effects of modern weapons.

TRAINING EXERCISES: All forms of formal exercises including MAPEX, TEWT, CPX, CFX, FTX, JTX, FCX, LFX, and FOF exercises.

TRAINING SIMULATION EXERCISES: Exercises employing training simulations, either manual or computer supported, in which staffs are exercised in command and control of combat, combat support or combat service support functions.

WEAPON FIRING EXERCISES: All exercises in which live ammunition is fired against targets on ranges.

II. CONSUMMABLES

<u>AMMUNITION DESIGNATED FOR TRAINING</u>: Munitions dedicated for and used during training exercises.

- COMBAT AMMUNITION USED FOR TRAINING: Standard issue ammunition used for training, usually called "training ammunition".

- TRAINING UNIQUE AMMUNITION: Ammunition designed specifically for and used only in training, including mortar practice cartridges, armor piercing practice cartridges, target practice cartridges, small caliber commercial ammunition, short range training ammunition, subcaliber ammunition, and smoke signature practice rockets.

- FIELD HANDLING TRAINERS: Inert replicas of ammunition used in ammunition handling training.

  - DUMMY CARTRIDGES: Inert cartridges
  - MISSILE HANDLING TRAINERS: Inert missiles that have the correct weight, balance, and connectors.

<u>BARRIER MATERIAL</u>: Material such as concertina wire, practice mines and simulants (fluids or powders used to represent NBC materials) dedicated for use in training exercises and used to create road blocks and to deprive soldiers free access to areas.

<u>POL</u>: Petroleum, oil and lubricants used during training exercises.

<u>SPARE PARTS</u>: Replacement parts required to repair equipment dedicated for and used in training.

<u>TARGET SUPPORT</u>: Targets, target devices and target systems to support live firing of the various types of weapon systems.

- TARGET: An inexpensive object sighted and struck during exercises in which training or training unique ammunition is fired, including a stationary, relocatable or towed target, armor integrated thermal signature and infantry personnel targets.

- TARGET DEVICE: A complex and expensive object sighted and struck during exercises in which training or training unique ammunition is fired; such as radio controlled fixed wing and helicopter targets.

- TARGET SYSTEM: The permanent range equipment required to present, monitor and manage remote and moving targets, including the integrated instrumentation and instructor work stations.

III. FACILITIES

SCHOOL FACILITIES

CLASSROOMS: Rooms for group instruction.

- LECTURE HALL: A room use for conferences, lectures and other instructional methods involving large groups of people.
- SMALL GROUP INSTRUCTION CLASSROOM: A small classroom for use with small group instruction and other instructional methods requiring a small space.
- LABORATORY: A classroom containing equipment used in conducting individual or small group training.

TRAINING BAY: A large enclosed area that houses operational equipment or simulators used in practical exercises or demonstrations.

MAINTENANCE BAY: A large enclosed area for use in maintaining equipment, including area for the storage of parts, and tools.

ADMINISTRATIVE OFFICE: A room used for the administrative support of training programs.

RESOURCE CENTER: A facility uses for the design, production and issue of instructional aids and equipment.

GYM: A room or building equipped for physical training and athletic games or sports.

DRILL FIELD: An outdoor area prepared for practicing marching and certain other athletic events.

STUDENT HOUSING: Facilities required to sleep and feed students participating in resident training programs.

RANGES

COMBAT TRAINING CENTER: A complex range system, such as at the National Training Center, supporting the use of tactical engagement simulations in combined arms exercises supported by range facilities for managing, monitoring, scoring, evaluating and debriefing these exercises. Also includes gunnery ranges for live fire exercises.

GUNNERY RANGE: A zone prepared for the live firing of weapons from fixed points, such as performing published gunnery tables.

TACTICAL RANGE AND MANEUVERING AREA: A gunnery range that allows tactical employment of weapon systems such as during live fire, not force-on-force exercises.

SUBCALIBER RANGE: A zone for firing weapons equipped to use subcaliber ammunition; a scaled range, substantially reduced in size when compared with the size of a range required for the use of standard caliber ammunition.

SCALED RANGE: A range used with standard ammunition and scaled targets, such as the 1000 inch range.

MULTIPURPOSE RANGE COMPLEX: A range designed to accommodate collective training for ground and aerial weapon systems, including multiple weapons, multiple levels of training (individual, crew, collective, and combined arms) and multiple training scenarios (offensive and defensive).

URBANIZED TERRAIN RANGE (MOUT): A range consisting of urban structures (buildings) for use in live fire or force-on-force (MILES) type exercises to teach individual, crew, and collective combined arms techniques used in urban combat.

IV. PERSONNEL

INSTRUCTION

INSTRUCTOR: Subject matter expert, trained in teaching techniques, who lectures, leads group discussions, demonstrates operations, evaluates student performance and guides students in meeting training objectives.

WEAPON SYSTEM QUALIFIED INSTRUCTOR: An individual certified in the operation or combat use of a complex weapon system, (e.g., a flight instructor) who tutors and evaluates the performance of a student on an operational system or in a simulator of that system.

ASSISTANT INSTRUCTOR (SMALL GROUP INSTRUCTOR): An individual who guides small group discussions.

DEVICE INSTRUCTOR/OPERATOR: An individual, usually without the credentials of a WEAPON SYSTEM QUALIFIED INSTRUCTOR, who initiates and operates a complex training device, performs those roles required in a simulation exercise but not simulated (e.g., tower operator) and briefs, tutors, and debriefs the student.

UNIT TRAINER: A unit leader who conducts training for individual, collective, joint or combined arms operations.

OBSERVER/CONTROLLER (O/C) CADRE: The instructor's staff in a variety of tactical engagement simulation exercises, training exercises, and training simulation exercises that provide performance feedback and carry out necessary tactical and management functions not being performed by personnel being trained.

INSTRUCTIONAL SUPPORT PERSONNEL

MAINTAINER: A technician who performs the scheduled maintenance, fault isolation, repair, inspections, and related tasks on a weapon system or other equipment.

AMMUNITION HANDLER: An individual who stores ammunition and supplies it to required sites.

POL HANDLER: An individual who stores petroleum, oil and lubricants, and transports them to the sites needing these products.

OPPOSING FORCE (OPFOR) CADRE: The force trained and equipped to perform the tactics of an enemy force (usually WARSAW Pact Doctrine) in Force-on-Force (FOF) exercises.

LEARNING CENTER STAFF MEMBER: An individual who maintains an inventory of training aids, provides them as required to students and instructors, and supports the use of these materials.

INSTRUCTIONAL MATERIAL DEVELOPER: Any one of a variety of specialists in some aspect of the instructional system development process.

- EDUCATION SPECIALIST: An individual, academically qualified in education, who serves as an advisor on matters such as learning theory, practice and evaluation to developers of instructional materials and performs other duties, such a design training materials, that require academic training in education.

- TRAINING SPECIALIST: An individual, with a specialty in a specific field of military science and military training practices usually obtained while serving in the armed forces, who serves as an advisor training system developers on matters requiring expert knowledge of a weapon system, military training or military operation, and performs such other duties requiring subject matter expertise.

- SUBJECT MATTER SPECIALIST: An individual, with expert knowledge of a weapon system or military operation, but not necessarily military training, who serves as an advisor to training system developers on matters requiring expert

knowledge of a weapon system or military operation, and performs such other duties requiring subject matter expertise.

- TEST AND MEASUREMENT SPECIALIST: An individual, academically qualified in the measurement of school performance who serves as an advisor to training system developers on test and measurement issues, and conducts the evaluation of instructional materials and courses of instruction.

- VISUAL INFORMATION SPECIALIST: An individual, trained in the design of graphic media, who serves as a planner on instructional material development projects such as overhead projection transparency sets, slide sets, posters, and videotape programs, and performs such other duties that require designing materials that must communicate via graphics.

- ILLUSTRATOR: An artist who creates the drawings and text required in the plans for graphic media designed by the VISUAL INFORMATION SPECIALIST, and performs such other duties requiring the creation of original art.

- WRITER/EDITOR: An individual who either writes or edits text used in instructional material, including the scripts use in developing audiovisual materials.

- WORD PROCESSOR: An individual who types the text used in instructional material, both draft material and the camera ready manuscripts. The word processor can use desktop publishing techniques, but does not perform phototypesetting operations.

- PHOTOTYPESETTER: An individual who operates phototypesetting systems, and prepares camera ready copy utilizing the full capabilities of this publishing technology.

- PHOTOGRAPHER/CAMERAMAN: An individual who uses a still, motion picture or television camera in recording visual images, or audiovisual sequences, for use in instructional materials.

- ACTOR: An individual who performing roles according to scripts before cameras.

- SCRIPT DIRECTOR: An individual who directs the actors, cameramen, and other technicians in the filming or taping of instructional sequences according to a script.

- COMPUTER PROGRAMMER: An individual that writes the computer code to create computer assisted instruction (CAI) or computer managed instruction (CMI) software specified by the system design document.

ADMINISTRATIVE PERSONNEL

TRAINING ADMINISTRATOR: The individual that directs, plans, organizes, guides, coordinates, and controls all or some aspects of the management and execution of a school program or other training program.

CLERK: The individual that performs the office support functions, including typing, filing, record keeping and related tasks.

V. PUBLICATIONS

ARMYWIDE TRAINING LITERATURE

FIELD MANUALS (FM): A Department of the Army publication designed to establish doctrine, or correct a doctrinal deficiency identified in the Battlefield Development Plan or the Mission Area Development Plan.

TRAINING CIRCULAR (TC): A paper document presenting information to be used in training programs, usually viewed as a temporary document with timely information to correct a deficiency.

SOLDIER TRAINING PUBLICATIONS (STP): A family of publications consisting of MOS specific SOLDIER'S MANUALS AND TRAINER'S GUIDES, and JOB BOOKS.

- SOLDIER'S MANUAL AND TRAINER'S GUIDE, MOS SPECIFIC: a publication for a specific MOS and skill level, and the soldier's trainer or first-line supervisor, containing standardized training objectives (task summaries) which can be used to train and evaluate soldiers on critical tasks which support unit missions during wartime.

- JOB BOOK: A publication that lists, by task number and title, the common, shared, and MOS- specific tasks for skill levels 1 and 2 for soldiers in a given MOS, and is used to record soldier proficiency and as a vehicle for transferring training information on a soldier from unit to unit.

MILITARY QUALIFICATIONS STANDARDS (MQS): A document that establishes standards for officer training throughout the Army to provide both Active and Reserve Component officers the knowledge and skills needed to accomplish their mission.

ARMY TRAINING AND EVALUATION PROGRAM (ARTEP): A program that supports collective training in units from squad through battalion levels, and is implemented through two publications: MISSION TRAINING PLANS (MTP) and DRILL BOOK.

- MISSION TRAINING PLANS: A publication that contains detailed training and evaluation outlines, collective training exercises and matrices, mission outlines and guidance on external evaluations to be executed in accordance with a unit's training program.

- DRILL BOOK: A book of battle drills that link individual and collective training, the fundamental collective building blocks of unit training for the lowest collective organizational levels, squads or platoons.

RESERVE OFFICERS TRAINING CORPS MANUAL (ROTCM): A document that contains information in support of Army training programs to be used by Reserve Officers Training Corps students when suitable material is not readily available in other DA publications.

DOCTRINAL LITERATURE

FIELD MANUAL (FM): (see definition under ARMYWIDE TRAINING LITERATURE)

TRAINING CIRCULAR (TC): (see definition under ARMYWIDE TRAINING LITERATURE)

JOINT PUBLICATION: A document that contains doctrine applicable to all four services that guide the employment of forces of the services in coordinated action toward a common objective, and bears a number for each service.

MULTISERVICE PUBLICATION: A document that contains doctrine applicable to two or three of the services, and guides the employment of the forces of the applicable services in coordinated action toward a common objective, and has been ratified by the participating services and bears a number for each of them.

FIELD CIRCULARS: A document that contains doctrine issued by a service school or integrating center to distribute their most current doctrine on a one-time limited basis pending publication of a field manual.

TRADOC 525 SERIES PAMPHLET: A pamphlet containing approved operational concepts, according to TRADOC Regulation 11-7, and provides direction to preparing agencies for the development of field manuals.

BATTLE REPORT: A document published as a TRADOC bulletin that contains lessons learned and provides interim doctrine until it is incorporated into an appropriate field manual.

INDIVIDUAL TRAINING EVALUATION PROGRAM (ITEP)

SKILLS QUALIFICATION TEST (SQT): A diagnostic tool that helps commanders, military personnel managers, branch schools, and soldiers gauge proficiency on specific MOS tasks. It is a written performance-oriented test on a representative sample of critical tasks selected from the soldier's manual.

COMMON TASKS TEST (CTT): A test that helps commanders assess a soldier's proficiency on combat and survival skills common among all MOS.

COMMANDER'S EVALUATION: A means of assessing a soldier's ability to execute job-related wartime tasks on a day-to-day basis.

CURRICULUM DOCUMENTS

LESSON PLAN: A formal or informal guide used by an instructor in conducting an individual lesson, containing such information as items of information to be presented, notes on how to present each item including instructional material to be used, and student activity related to each specific item of information. It also notes references used.

PRACTICE EXERCISE: Detailed directions for a student and an instructor for hands-on practice on a piece of equipment, including how to set up the equipment for practice, what to perform on the equipment, and how to evaluate performance.
PERFORMANCE TESTS AND WRITTEN TESTS: Programs for measuring student skills and knowledge related to the objectives of a course of instruction.

- LESSON/MODULE TEST: A skill or knowledge test administered at the conclusion of a lesson/module.

- END OF COURSE TEST: A skill or knowledge test administered at the conclusion of a course.

- DIAGNOSTIC TEST: A skill or knowledge test administered when required to determine the cause of inadequate performance.

TECHNICAL MANUALS

OPERATOR'S MANUALS: Job performance aids and reference documents, generally published as a part of the procurement of a weapon system, used by equipment operators in performing their

jobs on the equipment, including operational checks, equipment operation, and maintenance procedures performed by operators.

MAINTENANCE MANUALS: Job performance aids and reference documents, generally published as a part of the procurement of a weapon system, used by maintenance personnel and prepared for specific levels of maintenance, i.e., organizational, intermediate and depot maintenance, etc., supporting scheduled maintenance, fault isolation, repair, calibration, installation, programming and other forms of technical support of a system.

REPAIR PARTS AND SPECIAL TOOLS LISTS: Illustrated catalogues of replacement components along with the stock numbers required to locate or order these components.

TRAINING MANAGEMENT DOCUMENTS (examples only)

SYSTEM TRAINING PLAN (STRAP): The TRADOC master training management plan for a new system. It outlines the total training strategy to be used to develop and integrate the item into the training base and gaining units. It plans for all necessary training support, training products, and courses. It sets milestones to ensure the training strategy is fulfilled.

NEW EQUIPMENT TRAINING PLAN (NETP): An Army Materiel Command document which outlines milestones and other key data elements for training to support new equipment systems.

INDIVIDUAL TRAINING PLAN (ITP): A proponents plan to accomplish training requirements for any one of the following: each MOS, officer branch, functional area, area of concentration, or separate functional program and consisting of a narrative training strategy, milestone schedule, and resource estimates.

COURSE ADMINISTRATIVE DATA (CAD): Critical course planning information for each resident course of instruction, including course number and title, training location, purpose, scope, attendance prerequisites, special information, course data, training start date, and training development proponent. It is used by recruiting and personnel systems personnel to aid in having students and instructors on station in time for training.

PROGRAM OF INSTRUCTION (POI): A document that describes the training material and content, type of instruction, and resources necessary to conduct both peacetime and mobilization training in an institutional setting to include TRADOC service schools, Noncommissioned Officer Academies, U.S. Army Reserve Forces schools, and National Guard Academies.

EXTENSION TRAINING DOCUMENTS

ARMY CORRESPONDENCE COURSE: A printed training course, provided through the mail, for officers and enlisted members of the Active

and Reserve Components as well as civilians with a focus on professional development and job skills.

RESERVE RECONFIGURED COURSES: A modified form of a conference or lecture course (including schedule and course materials) that has been adapted to the needs of reserve training and reissued for that purpose.

UNIT DOCUMENTS

UNIT STANDARD OPERATING PROCEDURES (SOP): Documents that contain how the unit is to perform certain operations not specified by higher authority.

UNIT TRAINING STANDARD OPERATING PROCEDURES (SOP): Documents that specify how a unit will train, containing those details not specified by higher authority.

RULES OF ENGAGEMENT (ROE) FOR TRAINING EXERCISES: A set of directives for conducting realistic, safe and efficient training exercises, including procedures for realistic casualty assessment and weapons' effects, administrative orders, and tactical restrictions to ensure safe training.

VI. PERFORMANCE MEASUREMENT SYSTEMS

PERFORMANCE MEASUREMENT CONDUCTED IN INSTITUTIONS

ACADEMIC TEST: A set of test items (questions used in tests) designed to measure student achievement in the areas of recalling and understanding system theory, principles and facts in a course of study; background knowledge useful in performing a job but not the specific sequence of steps required to perform a procedure or operation. These tests are generally in the form of pre-tests, end-of-lesson tests, end-of-module tests, or end-of-course tests.

STUDENT INTERVIEW: A method of soliciting student opinion for the purpose of identifying student attitudes about the design and conduct of a training program, focused on factors not directly measured by test scores.

INSTRUCTOR INTERVIEW: A method of soliciting instructor opinion for the purpose of identifying problems in the design or conduct of a training program, including the degree of instructor confidence in the methods or materials employed.

EVALUATOR OBSERVATIONS: A method of obtaining expert opinion, based on an expert's visit to a school's classrooms, for the purpose of identifying problems and obtaining recommendations for improving the efficiency and effectiveness of a course of instruction.

PERFORMANCE-ORIENTED TEST: A paper and pencil type test composed of independent questions that each describe a step in the performance of a job and ask for specific information needed in the performance of the job-step.

SIMULATED PERFORMANCE TEST: A test requiring the student to perform all the steps in an operation, not merely answer independent questions about the operation, i.e., fill out a form when given information as it would appear on- the-job. This term is not generally used to describe student testing on simulators.

PERFORMANCE TEST: A test requiring the student to perform a hands-on operation on a piece of equipment or on a simulator.

PERFORMANCE MEASUREMENT CONDUCTED IN UNITS

SKILL QUALIFICATION TEST (SQT): A performance-oriented test normally consisting of a written test and may include a hands-on test as appropriate. The test measures individual proficiency in performing critical tasks related to the soldier's primary MOS. Results provide the basis for remedial individual training.

COMBAT TRAINING CENTER (CTC) EXERCISE: A force-on-force exercise conducted with tactical engagement simulation at a combat training center according to specific rules of engagement for the training exercise.

COMMON TASK TEST (CTT): A test that helps commanders to assess a soldier's proficiency on combat and survival skills common among all MOS.

DRILL: A standardized technique or procedure, which when critical to a unit's mission should be ingrained to allow spontaneous and instinctive execution. They are in the form of battle, crew and support drills.

EMBEDDED TRAINING: The use of performance scoring and record keeping routines built into an operational system, along with the simulated signals necessary for training and testing.

EMERGENCY DEPLOYMENT READINESS EXERCISE (EDRE): An administrative exercise to ensure that a unit is logistically prepared to carry out its wartime mission.

MISSION TRAINING PLAN EXERCISE (AMTEP): Collective exercises for various levels of command, specifying mission, tasks and standards.

WEAPON FIRING EXERCISE: An exercise in which soldiers fire ammunition, made available through STRAC standards, expended according to firing tables and evaluated for effectiveness.

TACTICAL ENGAGEMENT SIMULATIONS (TES): Free-play, force-on-force exercises using operational weapon systems equipped with MILES and similar weapons effect strap-on simulation components with real-time casualty assessments.

TRAINING EXERCISE: As used in this report it refers to any one of a series of types of formal exercises, including MAPEX, TEWT, CPX, CFX, FTX, JTX, FCX, LFX, and force-on-force exercises.

- MAP EXERCISE (MAPEX): Exercises that portray military situations on maps, overlays and event schedules to allow commanders to train their staffs to perform essential integrating and control functions at a low cost. Terrain models or sand tables can be used to supplement or replace the maps.

- TACTICAL EXERCISE WITHOUT TROOPS (TEWT): An exercise conducted in the field on actual terrain suitable for training units for specific missions. In this low cost type exercise a commander trains his subordinate leaders and battle staffs to analyze terrain, employ units according to terrain, employ weapons, plan to conduct unit mission, and to make best use of terrain.

- COMMAND POST EXERCISE (CPX): An exercise best conducted in the field for a commander to practice combined arms integration, and the tactical emplacement and displacement of command posts. In this type of medium cost exercise using leaders and staffs at various echelons, information is exchanged using tactical communications systems and personnel, estimates are prepared, appraisals are given, plans are prepared, orders issued, and sites are reconnoiter, select and tactically occupy as command posts, all driven by master schedules of events or battle simulations.

- FIELD TRAINING EXERCISE (FTX): A high cost exercise conducted under simulated combat conditions in the field involving command and control of all echelons in battle functions: intelligence, combat support, combat service support, maneuver, and communications. The exercise is conducted in a realistic environment, and may employ full combined arms teams against an actual or simulated OPFOR. It utilizes all unit personnel and equipment and exercises both individual systems and all the systems in the combined arms team in fighting an air-land battle.

- COMMAND FIELD EXERCISE (CFX): An FTX with reduced combat unit and vehicle density, but with full command and control, combat support and combat service support elements.

- LIVE-FIRE EXERCISE (LFX): A high-cost, resource-intensive exercise in which player units move or maneuver and employ organic and supporting weapon systems using full-service ammunition with attendant integration of all combat arms, combat support and combat service support. Unit and company team level is the principal focus of this type exercise.

- FIRE COORDINATION EXERCISE (FCX): An exercise used by a commander to train subordinate leaders, crews of direct fire weapons, FDC personnel, and forward observers. The exercise uses several weapon systems to engage multiple targets simultaneously as targets enter optimum engagement ranges. Subcaliber devices are substituted for service ammunition to permit fire planning and simulated employment of all weapon systems available to support the commander in the execution of his assigned mission.

- JOINT TRAINING EXERCISE (JTX): An exercise involving 2 or more services of the US armed forces, and may consist of a MAPEX, CPX, CFX, FTX or similar exercise.

- FORCE-ON-FORCE EXERCISE (FOF): An exercise involving opposing forces, generally using weapons effect simulators such as the Multiple Integrated Laser Engagement System (MILES) and related systems, as conducted at the National Training Center (NTC), Combat Maneuver Training Center (CMTC), and Joint Readiness Training Center (JRTC).

- SITUATIONAL TRAINING EXERCISE: Structured training applications developed by proponent schools or field units to teach the doctrinally preferred method of accomplishing a specific unit task. A situational training exercise enhances unit proficiency and involves maximum soldier and leader participation in achieving ARTEP performance standards. Such exercises are characterized by the integrated use of drills, standard operating procedures, leader tasks, and the use of tactical engagement simulations.

- TRAINING EXERCISE DATA COLLECTION: The technique and instrumentation used to capture, record, and analyze soldier, crew and unit performance date during and following exercises.

  - AUTOMATED DATA COLLECTION: Sensors and computer routines to automatically record and analyze data on complex training exercises, such as with the FOF type exercises using the NTC Advanced Workstation.

  - MANUAL DATA COLLECTION: The technique of using controllers, umpires and evaluators with damage and loss tables and related paper job aids to model the effects of activities within FOF and live fire exercises.

TRAINING SIMULATIONS FOR COMMAND AND CONTROL EXERCISES: A generic term for interactive vehicles, both manual and computer supported, through which command and staff elements are trained, rehearsed, and evaluated for the command and control of wartime missions.

- BATTLE SIMULATIONS FOR MANEUVER-TYPE UNITS: Data-rich dynamic models of combat effects used to train, depending upon the simulation, platoon or company personnel up to brigade and battalion commanders and their staffs in the command and control aspects of tactics, weapon system's capabilities and lethality, the proper employment of weapons, and relationship of terrain and man-made obstacles to such weapons.

  - COMPUTER SUPPORTED BATTLE SIMULATIONS: Battle simulations in which weapons effects, the modeling and analysis of command and control decisions, and the tactics of the opposing forces are generally computed automatically. Examples include Computer-Assisted Map Maneuver System (CAMMS), Deep Battle Integration Training (DBIT), Division Battle Simulation(DBS), and Brigade/Battalion Battle Simulation (BBS).

  - MANUAL BATTLE SIMULATIONS: Battle simulations in which weapons effects, the modeling and analysis of command and control decisions, and the tactics of the opposing forces are generally computed manually. Examples include Dunn-Kempf, Blockbuster, Pegasus, First Battle, and War Eagle.

- CS AND CSS SIMULATIONS FOR NONMANEUVER-TYPE UNITS: Data-rich training simulations of combat support and combat service support functions in which command and staff elements are trained and rehearsed for the command and control of battle support type operations.

  - COMPUTER SUPPORTED CS AND CSS SIMULATIONS: Free-play, highly credible, real time computer-driven battle environment which permits command groups at various echelons of combat support and combat service support to develop, refine and upgrade their staff procedures and decision making processes. An example is the Computer Assisted Health Services Simulation (CAHSS).

  - MANUAL CS AND CSS IMMOLATIONS: Free-play, highly credible aspects of a battle environment, created without the use of computer supports, which permits command groups at various echelons of the selected CS and CSS functions to develop, refine and upgrade their staff procedures and decision making processes.

SIMULATOR EXERCISE: An exercise conducted on a simulator or a major training device to assess student performance within a training program, or as a step in certifying or granting authority to perform or continue to perform specific operations. Example is the use of a flight simulator exercise on emergency procedures as a part of an annual recertification program for pilots.

SMALL ARMS FIRING EXERCISE: An exercise such as the annual small arms qualification test in which a soldier requalifies on his personal weapon.

Appendix F

Definitions of Key Terms

Appendix F
Definitions of Key Terms

This appendix contains definitions of key terms used in this report. The first group of terms relates to general training definitions. The second group applies to embedded training.

General Training

- Actual Training System - The third iteration of the training system design, based on complete NWS information available during full scale development. The actual Training System Design is an update of the baseline design. Its currency is maintained throughout full scale development and fielding in response to NWS modification, contractor training system designs, and update requirements from other sources.

- Baseline Training System - The second iteration of the training system design, based on more complete NWS information available during the demonstration and validation phase. The Baseline Training System Design is used to procure training support for full scale development and, with modifications and enhancements, production and deployment phases.

- Design Approach Philosophy - An overt position taken with regard to ITS design that forces design efforts to optimize for one of five dimensions: low cost, maximum effectiveness, maximum efficiency, maximum flexibility, or modernness (state-of-the-art).

- Design Optimization Prompt - An adjective, associated with a specific alternative design approach philosophy, that provides guidance about how the TS or ITS is to be optimized. These adjectives, applied to specific training system elements in requirement and procurement documents, will ensure that the TS and ITS are optimized in accordance with Army policy, goals, and design approach philosophies that exist in the NWS program.

- Design Optimization Prompt List - (For Training System Design Approach Philosophise)

LOW COST	MAX. EFFECTIVE	MAX. FLEXIBLE
Simple	High Fidelity	Moveable
Low Fidelity (Synthetic)	Individualized	Reconfigurable
General Purpose	Redundancy	Modular
Off-the-Shelf	Special Purpose	Multi-Purpose
Generic	Reliable	Growth Potential
Manual	Valid	Networked
High Density	Low Risk Technology	

MAX. EFFICIENCY	MODERNIZATION
Common Design	State-of-Art
Reuseable	Automated
Composite	High Technology
Standardized	Digital
Integrated	
Time-Shared	

- Future Training System Design - A log of actual training system changes that are being developed, but have not yet been fielded. The Future Training System Design is maintained throughout the remaining lifecycle of the weapon system.

- Initial Notional Training System Design - The very first concept or notion about the ITS design. Created during the concept exploration phase, the Notional ITS is based on preliminary, sketchy information about the NWS and is therefore, a "straw model" for a subsequent ITS evolution. The purposes of the Notional ITS Design are to 1) enable earlier, more accurate estimation of training resources, 2) maintain concurrent design of NWS and its components from the outset, and 3) get training developers involved earlier in the NWS program. With more time training developers will gain a more complete understanding of training situation, as part of the MANPRINT process.

- Integrated Training System (ITS) - All courses, media and methods, facilities, consummables, personnel, publications, and performance measurement systems necessary to train all MOSs required by the new weapon system at resident and nonresident sites. Integration occurs across MOSs to allow for collective training in the units.

- ITS Optimization Strategy - The plan for how training system elements in the ITS are designed in order to meet current Army training policy, training goals, and design approach philosophies. The ITS Optimization Strategy strives for optimization along the lines of training effectiveness, efficiency, flexibility, and reduced cost. The result is an ITS that provides maximum training effectiveness for a specified cost or training to predetermined standards at the lowest cost.

- Training Concept - A very early, broad characterization of the ITS, including factors such as training location sites, constraints, major training equipment, types of training, and target audience characteristics. In TRASER, the training concept is supplanted by a more formal ITS design as the SAT process proceeds.

- Training Policy - As a control on various TRASER IDEFo Diagrams, Army Training Policy refers to published regulations that pertain to ITS analysis, design, or evaluation. As an input to training activities, Training Policy refers to to public decisions, in the form of memoranda, messages or other official forms of communication, made by authoritative personnel in the Army Chain of Command about training for new weapon systems.

- Training Risk Areas - Specific training system elements that have unproven or untested technology in their design, thus representing risk to the overall success of the TS or ITS.

- Training System (TS) - A complete set of training variables, which includes all variables necessary to provide all resident (institution) and nonresident (unit) training for one Military Occupational Specialty (MOS). All MOSs, including operators, maintainers, and support personnel will be accounted for in a training system. Training systems are composed of elements. Notional training systems are preliminary versions of the actual training systems. Training systems are composed of courses, instructional media and methods, facilities, consummables, personnel, publications and performance measurement systems.

- Training System Design Elements - Discrete components which make up a training system. A taxonomy and definitions of these elements are provided in Appendix E.

- Training Technology - Developments in technical progression (State-Of-The-Art) concerning the application of science and engineering knowledge to training material (hardware, software, and lessonware).

Embedded Training Definitions

The following definitions apply specifically to the Embedded Training (ET) analysis in TRASER. Most are in the ET IDEFo diagrams and narratives in Appendix D.

- Cognitive Mediation (also referred to as Integrated Multiple Skills Performance) - a category of tasks or objectives which require the coordinated and rule-mediated performance of a number of complex skills in a parallel or closely linked serial fashion. An example of this type of task is the execution of a ground attack from a rotary-winged platform. During early learning stages, these tasks require extensive mediation to integrate component tasks and skills, and to learn the components. These tasks tend to be highly perishable in the absence of frequent reinforced practice, and are the strongest candidates for ET implementation.

- Commonality Analysis - process of identifying common elements among the stimuli or sensory model, measures of performance, and feedback and recording requirements to streamline the ITS design process. Applied to the process of ET design, it serves to provide an overview of ET component characteristics to point out unique and repeated training elements.

- Concept Conditions - The overall Army policy, tactical, and doctrinal conditions under which the NWS is expected to be deployed and operate. These also encompass the Army training concepts as defined for active, reserve and guard units.

- Concept Utilization - A category of tasks or objectives which require the utilization of complex concepts for discrimination or generalization, or the application of rules or principles to make valid decisions. An example of this type of task is determining whether an aircraft is approaching or departing by analyzing its visual aspect and navigation lights. Such skills are strong candidates for inclusion in ET.

- Contingency Procedures - a category of tasks or objectives containing procedures with inherent branching on a range of contingencies or assessed conditions. An example of such a procedure is starting a turbine engine, including reaction to all potential abnormal conditions. These tasks are strong candidates for ET implementation.

- Criticality - an attribute of task and behavioral performance objectives indicating their importance to mission success. It is equivalent to the conventional SAT or ISD decision factor of consequences of inadequate task performance.

- Perishability - a major factor influencing task and behavioral performance objectives which applies to the decay of component skills of the task or objective when frequent reinforced practice is not provided. This factor is roughly equivalent to skill decay rate, but is more general in nature than simply skill decay, in that it includes decay of the ability to perform tasks or objectives which are dependent on a skill.

- Personnel Turbulence - a changeover in personnel assigned to units due to promotions, transfers, combat casualties, etc. Crew compositions can change on a regular basis, directly impacting collective crew performance.

- Sensory Modality Analysis - process of analyzing and categorizing the training requirements by the types of sensory mode employed. This is driven by the types of stimuli presented or responses required by the weapon system

components. Sensory modal and possible stimuli include visual (e.g., movement detection, color encoding), auditory (including voice), tactile (including sense of touch, texture, or vibration), and kinesthetic (including stimuli related to sense of motion).

- Situational Environment - The personnel, temporal, physical, and geographic conditions which form the context in which the NWS operates, and which directly impact both what has to be trained and how well or often the training can occur.

- Stimulus/Response Complexity - related to the number of distinct sources of stimuli, the number of different responses the operator makes, and the number of different identifiable stimuli patterns present. Greater numbers in any of these categories directly increase the task stimulus workload, and increasing workload is a good indicator of the need for sustainment training.

- Task Characteristics Model - an approach to estimating the need for sustainment training which emphasizes the types of tasks required of the operator or maintainer in the system. The model is a result of a logical analysis of the decision models in the Systems Approach to Training (SAT) and Instructional System Development (ISD) media. The purpose is to identify factors likely to be important to the ET requirements definition process.

- Task Complexity - related to the number of different tasks and subtasks performed by the operator in normal operation, the need for speed in detection or response, or the presence of psychomotor tracking tasks. An high number of unique tasks, or reliance on speed or tracking increases the training demand and increases the support for the acquisition of ET.

- Training Concept - A subset of concept conditions which directly applies to the policies for training the active, guard and reserve Army. These conditions serve as controls during the ET requirements formulation process.

- Training Factors - specific requirements for ET which are based on considerations of who needs to be trained, and where and when training can occur, as well as known characteristics of the NWS tasks and operating environment.

Appendix G

Embedded Training

Appendix G
Embedded Training

Embedded training (ET) is a pertinent issue in training research and analysis. Due to Army Policy that ET must be considered in new weapon system developments and product improvement programs (PIP), it will become an increasing consideration in the design of new weapon systems and must, therefore, be considered very early in concept formulation of both the weapon and training systems. Since ET is such a significant topic in both weapon and training system design, it has been treated as a separate appendix in this report. The following sections present a background view on the role of ET in Army training policy, the TRASER approach to ET, the ET concept development process, ET information sources, and special considerations for ET in collective training. ET-specific definitions are provided in Appendix F, Definitions of Key Terms.

Background

The Army's interest in the use of ET is not new. The development of ET on fielded systems predates the formal Army policy on ET signed by General Maxwell R. Thurman, then Vice Chief of Staff of the Army, and the Honorable James R. Ambrose, Under Secretary of the Army, dated 3 March 1987. That Department of the Army policy states that: "an embedded training (ET) capability will be thoroughly evaluated and considered as the preferred alternative among other approaches to the incorporation of training subsystems in the development and follow-on Product Improvement Programs of all Army materiel systems" (Policy and Guidance Letter, Subject: Embedded Training, 1987). As a result, all new systems contain sections in their Operational and Organizational (O&O) plans which specifically call for and define the requirements for ET. As leaner defense budgets continue to cut into the dollars available for training facilities, exercises, ammunition, and personnel, the Army will increase its interest in finding cost-effective training delivery media which meet its combat readiness requirements.

The objective of the ET component within TRASER is to formalize the procedures for establishing when ET is a feasible training alternative, to what degree or over what aspects of training it applies, and what system design decisions must be made to support the training hardware, software, and courseware development and integration with the new weapon system.

The TRASER system is sensitive to the role of ET within the new weapon system training concept. As part of the concept development process, TRASER, when developed, should include tradeoffs between combat simulation devices and comparable training provided by ET, and should consider whether various

degrees of ET application are achievable and appropriate. In developing this component of TRASER, the TRASER team drew as much information as possible from existing literature, such as the ten volume set of ET guidelines recently developed by the US Army Research Institute for the Behavioral and Social Sciences (ARI) and the Project Manager for Training Devices (PM TRADE) (see Table G-1 for a list of volumes and authors). In addition, the team drew from related ET reports which documented lessons learned through evaluating various fielded ET systems, and from experience obtained while developing ET concepts for the precursor to the Army's heavy force modernization program, the Armored Family of Vehicles (see Roth, Cherry, and Strasel, 1988), and from ET designs for the Army's Fiber Optic Guided Missile system, FOG-M (see Purifoy, Harris, Ditzian, Meerschaert, and Wheaton, 1985).

ARI and PM TRADE's ten volume set of documents includes guidelines and procedures that support the effective consideration, definition, development, and integration of ET capabilities for existing and developmental systems. The series was intended for use by systems, training, and materiel developers in making the initial decision about whether to include ET in a given system development effort, and the ongoing decisions regarding the form of ET within the total training system. The guidelines were structured into topics which apply to ET design and implementation decisions occurring at various phases in the Army's Life Cycle Systems Management Model (LCSMM). Within TRASER, the application of the guidelines has focused on the development of new training systems to support major new materiel procurement, although the guidelines also apply to ET considerations during product improvement.

Table G-1: Summary of the Ten ARI/PM TRADE Documents on Implementing Embedded Training (ET)

Topic	Authors	Summary
Volume 1: Overview	Finley et al.	Presents an overview of the guidelines and procedures, including the contents of the volumes, their relationships to the Army's LCSMM, and each volume's users. Contains a brief discussion of what constitutes ET, the benefits and capabilities it can provide, and advice regarding circumstances to create and to avoid in order to increase the likelihood of a successful ET development.

Table G-1: Summary of the Ten ARI/PM TRADE Documents on Implementing Embedded Training (ET)

Topic	Authors	Summary
Volume 2: ET as a System Alternative	Strasel et al.	Presents guidelines for making the initial decision at the system level about whether to include ET in the system design, and aids in answering four essential questions: 1) are there policy considerations that dictate the use of ET?; 2) do the tasks require frequent sustainment training?; 3) is the development of ET feasible?; and 4) will ET be cost effective for this system?
Volume 3: The Role of ET in the Training System Concept	Roth et al.	Document provides the means for developing training strategy and ET role concepts, especially when behavioral requirements for opertor and maintainer roles and functions have been generally defined but the specific tasks have not. This volume can aid in specifying ET alternatives to be evaluated as in various front end analyses, including cost and effectiveness analyses.
Volume 4: Identifying ET Requirements	Roth et al.	Procedures are used to determine the requirements for an ET capability, and for determining more precisely which tasks of the total job need sustainment training. Assuming such needs exist, the questions of entry level, cross, and refresher training requirements can be addressed.
Volume 5: Designing ET Component	Roth et al.	Procedures will be used in conjunction with the Logistics Support Analysis (LSA) process to configure the instructional design of the ET package and to conceptualize the nature of the interface with the operational system hardware and software.

Table G-1: Summary of the Ten ARI/PM TRADE Documents on Implementing Embedded Training (ET)

Topic	Authors	Summary
Volume 6: Integrating ET with the Prime System	Evans and Cherry	Identifies key factors and decision points which must be considered to ensure the successful integration of ET with the prime system. Outlines ET parameters and functions from the training developer and system developer perspectives, and critical integration issues derived from lessons learned in the ET development process.
Volume 7: ET Test and Evaluation	Purifoy and Ditzian	This document presents what is known and recommendations on how to proceed with ET test and evaluation. In plant testing prior to operational test of materiel system is especially appropriate for ET. Recommendations for same are based on experience and current Army test policies.
Volume 8: Incorporating into Unit Training	Roth et al.	Document provides guidance to developers responsible for creating documentation, such ET as users manuals, instructor guides, etc., to support utilization of the ET component by unit personnel.
Volume 9: Logistics Implications	Cherry et al.	This guideline defines the ways in which training developers and logisticians must interface. The interaction includes determining equipment usage factors resulting from anticipated use of the ET component, and developing post deployment logistical and training development support capabilities.
Volume 10: Integrating ET into Acquisition Documentation	Carroll et al.	Detailed guidance is provided for developing ET inputs into the government acquisition documentation from the MAA to the Integrated Logistics Support Plan (ILSP) to the Request for Proposal (RFP) and Statement of Work (SOW).

The ARI ET guidelines operationally define ET as: "...that training which results from the use of a feature or features incorporated into the end item of equipment, i.e., the operational system, to provide training and practice using the end item equipment. The features may be completely embedded within the system configuration by software application or a combination of both software and systems configuration; or may be executed by some form of strap on (e.g., a video disc player), or plug in (e.g., a floppy disc) equipment; or a combination of embedded and appended equipment" (Finley, et al., 1988).

Consistent with training system features in general, features of ET must include stimuli necessary to support training; they should include (1) performance assessment; (2) feedback consistent with improving and reinforcing correct performance; and (3) record keeping, to allow management of individual and collective performance trends, improvements and deficiencies requiring additional training.

With the majority of weapon systems under development relying on increasingly sophisticated computer systems for their operation, it is natural to consider leveraging the computer capabilities to provide some aspect of system oriented combat training. The advantages are many. Not only will transfer of training between the training device and the operational device interfaces be increased significantly, the overhead of transporting soldiers to remote training sites, and the operational and maintenance costs of those sites will be reduced as well. Embedding such training within the weapon system is not without costs and risks. Adequate additional computer resource and processing capability must be available to support ET within the operational device, and system combat readiness must not be compromised during such training.

TRASER Approach to ET

The nature of ET, wherein computer-based training is delivered using the NWS itself, places new demands on both the training and system developers to identify the requirements for ET early in the system design process, and ensure that adequate resources are provided to enable training to occur at fielding. Yet ET is one of several approaches to the total training system, and requirements should be weighed in that light. A goal of ET in the TRASER design has been to provide links between the ITS and weapon system design process to help ensure that the ITS is ready and current when the weapon system is fielded.

Within the TRASER system, ET is one of several media considered for training delivery. The key attribute which distinguishes ET from other training media is that it delivers

training on the new weapon system (NWS), or end item equipment, itself. The decision to consider ET as an option is initially based in part on policy, and then on the opportunities, requirements and costs associated with delivering training on the NWS versus other delivery media.

Since ET exists as one of several training media within the ITS, the decision to use ET should be based on the value added by ET to the ITS' ability to deliver training where and when needed. ET effectiveness and cost are strongly affected by the hardware, software, and soldier-system interface (SSI) opportunities which exist to support training on the NWS. The value of ET also depends on the environment or conditions in which the system operates and how those conditions differ in peacetime, mobilization, or war. The kind, frequency, and availability of training during peacetime may be significantly different from that afforded by the nature of war. ET can enhance the intentional aspect, and overcome inconsistencies due to access, availability, and other factors during peacetime and wartime. Limited time to train, due to fuel or ammunition or range restrictions hamper training success. Complex or perishable skills need frequent refreshing or repetition for sustainment. Inappropriate or inadequate training delivery mechanisms fail to overcome the inhibitory affects of fear, stress, or fatigue. Similarly, unique mission or operational conditions may exist in the unit which heighten the demand for readily available, relevant training materials.

The top-down TRASER ET analysis is driven by system performance requirements and constraints, and by the realities of training delivery and overall system operational conditions. In a departure from traditional approaches to training requirements estimation, the approach first considers who is being trained, and where and when the training occurs, rather than concentrating solely on system, task, or operator descriptions derived from historical or predecessor systems. The top-down early requirements focus enables a proactive stance toward the system design, provided through continual communications between training, system, and combat developers. Increased emphasis is given to the <u>where</u>, <u>when</u>, and <u>who</u> factors of training (i.e., <u>where</u> does the training occur, <u>when</u> does it occur, and who needs to be trained?). The outcome is a description of <u>what</u> system-based skills need to be trained, and <u>how</u> best to deliver them via ET.

Costs of delivery approaches based on travel time, materiel and personnel resources are used in the TRASER ET decision process. The tasks being trained receive attention by addressing the who, what, and where factors early, and maintaining interaction with the system developer. Difficult tasks can be identified and eliminated in the process of design iteration.

Placing a cost on training these difficult tasks early in the design also provides additional data to the trade-off process, and further enhances the likelihood of positive design changes to enhance the soldier machine interface, improving soldier performance and reducing the training burden.

In order to have the greatest impact on the NWS design, the initial consideration of ET in TRASER is made at the earliest stages of system conceptualization and development. This consideration takes into account at least three aspects of ET as it relates to what is known about the developing system: (1) the appropriateness of ET as a component of the supporting training system; (2) the feasibility and practicability of developing and implementing an ET component; and (3) the probable cost-effectiveness of an ET component for this application. Appropriateness considers the nature of the mission, tasks, soldier performance, and the operational environment to determine a potential ET requirement worth further consideration. The characteristics of the NWS hardware, software and SSI configuration are reviewed for their ability to support some form of ET. Available ET and alternative ITS development and operating cost data, and training effectiveness data, which attempt to quantify the system performance benefit achieved with proficient human performance, form the basis of comparison in the third assessment area.

Once an initial decision is made to continue considering ET for the system, the decision process is revisited several times throughout the ITS design process. Such iteration is necessary because the developers' information and knowledge about the appropriateness, feasibility, or cost-effectiveness of ET will necessarily increase as the materiel requirements proceed into system concept formulation and subsequent development. For example, the appropriateness of ET will be better clarified when more detailed descriptions of the soldier performance and training requirements posed by the system are made available for analysis. Similarly, the feasibility of incorporating an ET component into the system will be clarified by more detailed statements of system hardware, software, and personnel components.

Because TRASER proceeds with the initial consideration of ET so early in system acquisition, this consideration will necessarily be based on what is usually very limited information dealing with the mission and functional requirements of the system as defined at the Mission Area Analysis stage. TRASER ET considers the available mission and functional requirements information in relation to all relevant factors.

The ET component within TRASER can be summarized as a two part decision process, where the goal of the first part is to

establish the value of ET and the need for its further consideration in ITS design using a top-down approach. The second part establishes the preliminary ET concept based on increasingly detailed or changing information, and includes a bottom-up view of tasks and skills.

Once the decision to use ET has been made, its actual form can range from fully embedded and on-line, to strap-on and off-line. These forms, modes of operation, and types of ET are defined with other training media and methods elsewhere in this report. Deciding on the specific form of ET depends on many system, operational, and personnel variables, and requires that ET be considered early in the weapon system development process to ensure adequate capacity to support the training requirements with existing hardware or software capabilities.

TRASER Embedded Training Development

The structure for incorporating ET within the TRASER system architecture was based on published ET guidelines and procedures, on lessons learned from Army and other service ET design and development efforts, and from the design and operational experience of the project team. Of particular relevance to the TRASER ET development were volumes 2 (Strasel et al., 1988), 3 (Roth, 1988a), 4 (Roth, 1988b), 5 (Roth, Fitzpatrick, Warm and Ditzian, 1988), 6 (Evans and Cherry, 1988), and 10 (Carroll, et al., 1988). A driving force behind the TRASER ET approach is the need to start ET consideration early in the weapon system design effort to ensure that sufficient resources will be reserved for its successful implementation later.

As outlined in the sixth volume of the ET series (Integrating ET with the Prime System, (Evans and Cherry, 1988)), the development of the ET subsystem (i.e., the hardware, software, and courseware which supports the training) must coincide with the development of the major item, or prime system. This is because ET relies on the materiel system's hardware and software for its operation. Unlike alternative, traditional forms of instructional design, ET design decisions cannot be delayed until the major item is completed and its hardware and software capacity is committed.

Successful ET development requires a coordinated team approach where team members are drawn from training developer (TD), combat developer (CD), and materiel developer (MD) communities in the Army, and from similar components of the contractor development team. This pool of prime system and ET developers must maintain communication throughout the materiel system development process. Training developers, whether part of TRADOC or members of contractor development teams, continuously must make tradeoffs to establish priorities in their effort to realize "ideal" ET. Every effort has been made to address this requirement within TRASER.

The TRASER procedures for ET concept development were designed for repeated application, as increasingly detailed data become available on the NWS, its personnel, and the conditions of operation. Consequently, the basic processes as presented in block A01 (Develop the Initial Notional Training System Design) and A02 (Refine Baseline Training System Design), do not differ. Depending on the quality and quantity of data available at the outset, some portions of the analysis may be ignored in the first passes through A01, but definitely should be revisited at a later time. The process in block A02 reflects the later review of data and processes, as well as a critical review of the ET data and design for completeness and consistency. To facilitate the iterations, recordkeeping, and audit trails necessary to document the ET analysis process, the use of a computer database is assumed and strongly recommended in the process.

The top-down portion of the TRASER ET approach uses a high level decision hierarchy and associated questions to identify ET opportunities, requirements, and costs. The hierarchy is an extension of the decision processes outlined in Volume 2 (see Strasel et al., 1988) and in (Evans and Cherry 1988). That hierarchy has been incorporated within the processes of block A01, specifically in blocks A011112, A0115, and A013, to identify the ET suitability. The output from that top-down decision process is combined with a detailed bottom-up approach focusing on specific tasks and skills to scope possible forms which the ET concept may take. These concepts are considered in iterative comparisons with other TRASER training media selections in blocks A014 and A022.

ET Suitability

TRASER information relevant to ET suitability includes Army policies, mission area analysis, ET criteria, new weapon system data, and any data on historical systems. This information is assembled and evaluated to identify the minimal ET training features available in the weapon system design. Also considered is the availability of the equipment for ET use. The NWS description is evaluated to determine the available processor capacity, storage capacity, and electronics architecture. Effective ET will require significant computer capability for implementation, as well as numerous interfaces with parts of mission system equipment (sensors, displays, controls) and with operational software.

The nature of the soldier system interface, particularly the mode of stimuli input, response, and information processing, result from prior NWS design decisions. Training and resources, such as soldier and system time in garrison, on exercises, or in combat, as well as time spent traveling to and from and waiting to use simulators, also dictate opportunities. Questions which the training developer must answer in TRASER include:

- Does the NWS have sufficient capacity to support ET functions?

- Does the NWS have sufficient capacity to store stimuli, responses, and lessons?

- Does the system support stimuli presentation, feedback, and response trapping?

- Are input stimuli processed and electronically displayed?

- Is the system activation controlled via electronic modes?

- Can the primary tasks be represented by discrete movements?

- Do human information processing tasks employ multiple or single channels?

- Do soldiers have idle or unproductive time in garrison, on exercises, or in combat?, and

- Does the system experience significant idle time?

The data to support these decisions, as well as the outcomes, are saved as a NWS ET opportunities list. In general, an affirmative answer indicates that opportunities exist to support some form of ET on the NWS.

The second aspect of the process considers training requirements, particularly for acquisition, sustainment, and training management. The focus is on high level mission and situation-based factors, independent of the NWS itself. Training requirements assigned to ET play a key role in driving the NWS SSI or hardware design decisions.

When considering ET for acquisition training, it is important to note that ET will not substitute for acquisition training received in basic training, but will fill the gap in new skill introduction and acquisition for special cases. Questions to be answered for acquisition training requirements include:

- Will untrained soldiers be required to man positions?

- Will the task complexity allow such random assignments?

- How critical to mission success is integrated team performance?

- Even with fully trained individual skills, does integrated team performance require some group training time?

- Is rehearsal in combat context and situation critical to optimal performance?

- Will replacements require training to round out required skills?, and

- Can training for successive grades or positions occur in the unit?

The requirements based on sustainment issues consider task perishability, skill mastery, and refresher training. Questions include:

- Do task skills and knowledge decay in the absence of practice or feedback in peacetime or in war?

- Is performance adversely affected by stress or fatigue?, and

- Will personnel called up or transferred be current on operational or combat operations?

An essential aspect of any training system is the ability to evaluate student performance. In the case of ET, the developer should be able to estimate the degree to which the system interface can support the types of performance evaluation necessitated by the training tasks. The questions of concern are:

- Is performance evaluation possible or greatly enhanced only when provided within the embedded system?, and

- Does the system need instrumentation to support training?

Training requirements are evaluated against opportunities and costs to establish suitability. The process in TRASER is similar to that presented in Phases 1 and 2 of the ET requirements analysis process described in volume 5 of the ET guidelines (see Roth et al., 1988).

ET Concept

The TRASER process to establish optimal embedded training follows the analysis outlined in successive detail in Phases 3 and 4 in the ET volume 5 (see Roth et al., 1988). Training priorities, performance measures, and developer supplied assessments of risk and certainty are considered in the process. ET scope, content, and implementation approach are identified.

Collective Training

The emphasis in the ARI/PM TRADE ET guideline documents has been on individual or crew training. For systems which support command, control and intelligence in all battle functional areas, however, ET should be considered as an attractive and preferred alternative for collective and unit training. Collective command and control tasks are characterized by their cognitive and decision-making nature, where the team performance and its interactions with other aspects of the battle environment are the subject of training. However, this requires special thought and analysis to design the ET component to provide proper stimulation, response trapping, and performance analysis. Here the ET design tradeoffs must consider the perspective of activities of the command staff.

An analog for ET design issues may be found in studies of command post exercises (CPX), field training exercises (FTX), and other war gaming activities. Similarly, the elements of the Battle Command Training program (BCTP) and other training simulations which support platoon, company, battalion, and brigade level training, should be studied for lessons and examples applicable to how to identify, deliver, and evaluate collective training via ET.

Unique ET Information

System Operational Drivers. System operational drivers aid in describing the use of a system within a unit during peacetime, mobilization, and war. Emphasis is placed on the intensity and nature of NWS use, and is analogous to the information captured in the Operational Mode Summary/Mission Profile (OMS/MP), with additional detail to cover those periods when the system is idle. The type of unit (Active, Guard, Reserve), the OPTEMPO expected in various theaters, and expected training cycles are considered. Standards for system and crew performance, and the need for trained soldiers, crews or teams, and units should be included to answer the questions on ET opportunities and requirements.

Personnel Drivers. The structure for personnel status of a unit should consider changing conditions during peacetime, mobilization, or war. The data set addresses the impact of turnover, turbulence, and attrition on the status of individual soldiers, crews or teams, and the unit as a whole. The resulting structure includes such factors as MOS-grade position match, time in position, crew stability, team stability, and empty spaces or positions. A suggested approach for establishing the structures would be to analyze actual units in peacetime and project likely turbulence and stability during mobilization and war. In the

peacetime setting, the Enlisted Master File can be used as a starting point, with data collected from units and from DCSPER databases providing the necessary detail. Unit or Occupations databases from the Training and Performance Data Center (TPDC) may also provide information. For the wartime setting, the results of Cost and Operational Effectiveness Analyses (COEA), past analyses using combat models at the corps level, and subject matter experts could provide alternative starting points.

Training System Boundaries. The training concept should be developed with a total Army perspective in mind. The resulting structure will include such factors as range characteristics and capacity, institutional capacity, instructors, facilities, and funding available to units from different components. The starting point will be a top-down allocation of funds to various resources used in training as developed from databases in DCSOPS, TRADOC, FORSCOM, EUCOM, or TPDC.

Summary

The objective of the TRASER design effort is a single integrated, top-down approach to Army training. The focus is on the need to provide training related to (1) personnel management policies in peacetime, (2) attrition during wartime, and (3) the conditions under which that training must be delivered, including trainee time available and training resource constraints. It forms a basis for the proactive integration of training system design and training factors with weapon system design, and defines the context in which decisions regarding the use and scope of ET can be made.

Appendix H

Concept Based Requirements System (CBRS)

Appendix H
Concept Based Requirements System

The Concept Based Requirements System (CBRS) is the methodology TRADOC uses to identify and prioritize Army warfighting requirements (Combat Based Requirements System, 1989). Five types of requirements are analyzed. They include requirements for (1) doctrine, (2) training, (3) leader development, (4) organizations, and (5) matcriel. TRADOC uses CBRS to support efforts to plan and program for the future Army.

The Combat Developers within TRADOC headquarters and the proponents are the primary users of the CBRS, assisted by other TRADOC personnel, such as Training Developers, and Resource Managers. It is the interaction between the Training Developers and Resource Managers with CBRS that impacts TRASER development. It is also these interactions that are of primary interest in this brief description of CBRS, with some observations on possible CBRS-TRASER interactions.

The eight phase CBRS problem-solving model depicts the operations that take place within CBRS. These operations include:

1. Define the problem, i.e., state what is to be fixed or achieved.

2. Understand how the current threat impacts on the problem.

3. Uunderstand how technology can effect the concept, i.e., technology that can help bring about a solution to the problem.

4. Develop a concept of what the Army should do to solve the problem.

5. Develop alternative Operational and Organizational (O&O) Plans to solve the problem.

6. Evaluate alternative O&O's to show the impact of proposed actions.

7. Choose what action to take.

8. Develop the package to implement an O&O plan.

A series of formal processes are used to carry out the steps in this model. TRADOC Regulation No. 11-15, Concept Based Requirements System (draft), describes the processes to be used. Figure H-1 shows these processes and their relationships as

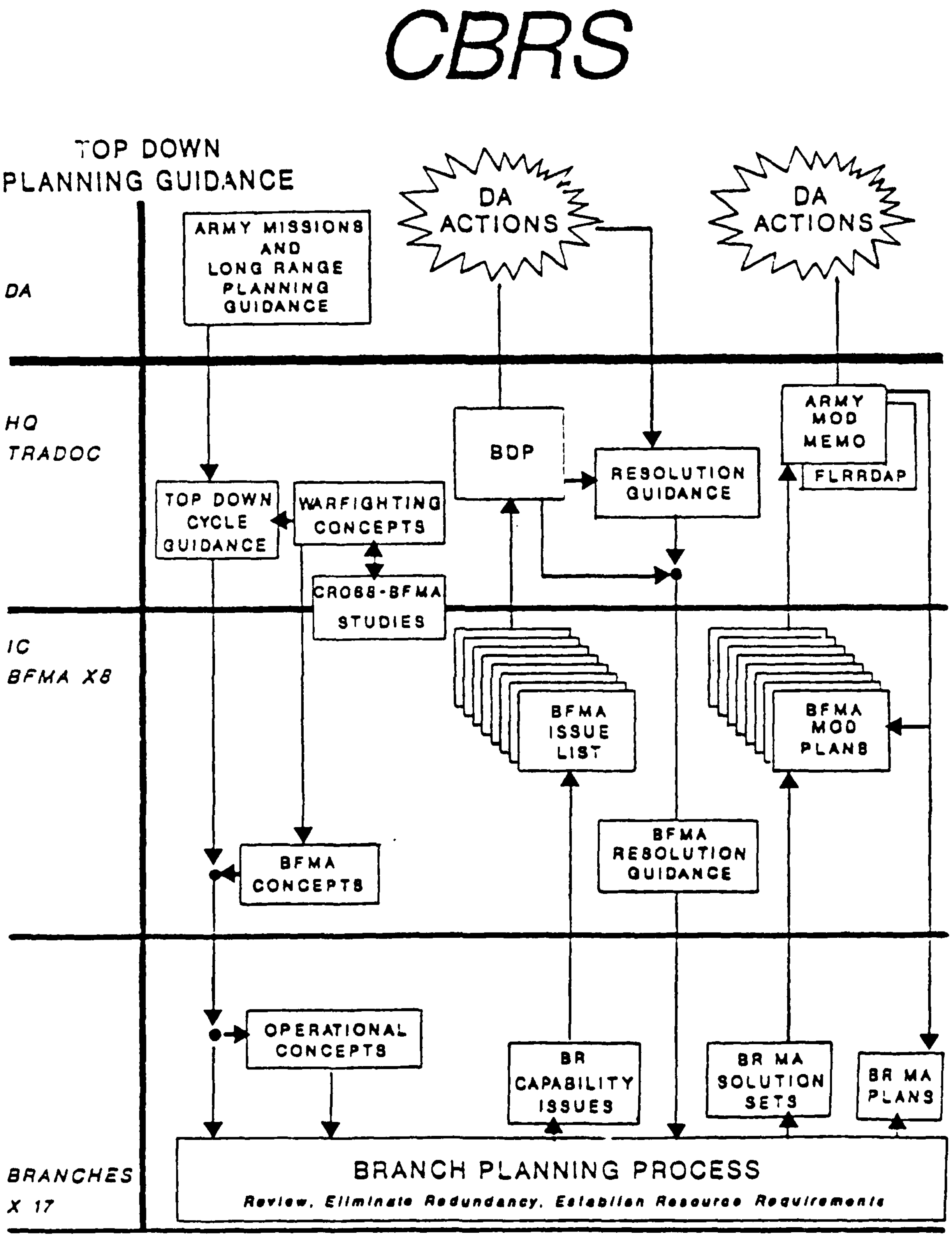


Figure H-1. Concept Based Requirements System (CBRS)

depicted in TRADOC Regulation No. 11-15. Certain of these processes that impact directly on TRASER are described here. Included are (1) Cross-BFMA Studies (i.e., Mission Area Analysis), (2) Battlefield Development Plan, (3) Army Modernization Memorandum (AMM), and (4) Operational & Organizational Plan that emerges out of the Branch Mission Area Plans. A more extensive description of the processes used in performing CBRS is beyond the scope or requirements of this study.

Cross-BFMA (Battlefield Functional Mission Area) Studies

One of the chief forms of this type of study is the Mission Area Analysis (MAA). The purpose of the MAA is to assess the capabilities of programmed Army forces to be successful on the future AirLand Battlefield. A three-phased analysis is used in conducting the MAA: (1) identify capability deficiencies and efficiencies in a selected mission area; such as Army Aviation, (2) evaluate enhancement opportunities; such as new technologies, and (3) propose corrective actions in the areas of doctrine, training, organization, and materiel.

When the proposed corrective action is a materiel solution, i.e., a new weapon system or the modification of an existing weapon system, TRASER techniques can be used during the development of the weapon system as an aid in designing the supporting ITS. If the proposed corrective action is a training solution, TRASER could be used in identifying alternatives and in choosing one as the solution. This latter application is beyond the scope of TRASER as currently being designed. Extension of TRASER to meet this requirement, however, is feasible and can be the subject of future designs.

Within the MAA, a broad area of activity is investigated (such as all Army aviation). The observations and recommendations are given extensive visibility and hold a high level of prestige in the planning community. The MAA has the power to change the way the Army does business. When problems are presented in the MAA, corrective actions are generally taken. It is a basic document for initiating change.

Battlefield Development Plan (BDP)

The TRADOC BDP contains a prioritized and integrated list of the Army's battlefield capability issues derived from the MAAs, and the related Battlefield Functional Mission Area (BFMA) issues that evolve during the interaction between integrating centers and branches, and among branches. The TRADOC BDP describes the future battlefield in terms of expected environment, and battle doctrine. It also presents a capability assessment, and provides guidance with which to overcome capability weaknesses and exploit capability strengths.

Recommendations are fed into the Planning, Programming, Budgeting, and Execution System (PPBES) through the TRADOC BDP. Therefore, the BDP is a significant step in programming funds for materiel changes to meet threats. TRASER is to be used in designing the training for the operation, maintenance, support, and tactical employment of the materiel changes. The BDP alerts the training developers to forthcoming tasks and funding restrictions that will apply in carrying out these tasks.

Army Modernization Memorandum (AMM)

The AMM is the key TRADOC product recommending the architecture for the future Army. It provides a comprehensive, constrained strategy for the Future Army, and includes prioritized solution sets, in incremental packages, that best resolve battlefield needs. The AMM helps HQDA build the Program Objective Memorandum/Extended Planning Annex, justify programs, and take decrements. The approved AMM provides branches and mission areas the guidance necessary to establish resource requirements for their respective solutions. In doing so, branches and mission areas must focus their constrained resources in areas that best serve the Army from a holistic perspective.

Branch Mission Area Plans and Operational & Organizational Plans (O&O Plans)

O&O Plans are expressions of Branch Mission Area Plans. The purpose of an O&O Plan is to initiate the research, development, and acquisition of a materiel system, as required to support approved operational and functional concepts. It provides decision makers with the minimum essential system-specific information to initiate the Proof of Principle (Concept Exploration) phase of an equipment procurement program. The O&O Plan is an output of the CBRS. System training must be addressed in the O&O Plan. While only a short statement is required, a careful consideration of how training will be conducted, and the impact of training on system performance must be addressed by the authors of the O&O Plan.

At this early point in the weapon system design process TRASER can make a contribution. This contribution can be of two types. First TRASER can be used in considering the impact of alternative weapon system design approaches on training programs and, therefore, the possible impact of training on the cost-effectiveness of the proposed system. It will be a tool for considering alternative situations and can be used by the training developers, working with the combat developers, in considering alternative solutions for meeting projected battlefield deficiencies. Second, it can be used to strengthen the link between the combat developers and the training developers. During the CBRS processes, considerable data is generated (i.e., initial task listings) which will be of value in

the early phase of the application of the Systems Approach to Training (SAT). While much of these data are not formally recorded for use in SAT, if the training developers are actively supporting the combat developers in the analyses leading to the writing of the O&O Plan, they will be able to capture appropriate data for their use in implementing SAT.

In addition there are related programs that are improving the linkage between CBRS and SAT. Two of these are described briefly below.

Programs that provide linkage between CBRS and SAT

Two interrelated programs that function to bridge the gap between CBRS and SAT are the Blueprint of the Battlefield, and the Systems Approach to Training Analysis.

Blueprint of the Battlefield. This program presents a comprehensive hierarchical listing of Army battlefield functions and generic tasks and is similar to a CBRS set of battlefield terms. It serves as a common reference system for field commanders, combat developers, analysts, trainers, and planners in considering and discussing the actions the Army performs in combat. It is to be used as a starting point for evaluating and developing doctrine, training, organizations, and materiel within the CBRS. When fully adopted by combat developers, materiel developers and training developers, this taxonomy-like structure of task descriptions will greatly enhance the clarity of communication among these three communities.

The Blueprint is made up of seven Battlefield Operating Systems (BOSs). They are (1) Maneuver, (2) Fire Support, (3) Air Defense, (4) Command and Control, (5) Intelligence, (6) Mobility and Survivability, and (7) Combat Service Support. Within each of these BOSs, generic functions are named and defined. In addition, generic tasks required to perform the functions are also named and defined. This hierarchy of terms makes it possible for analysts from various disciplines to discuss the requirements of the battlefield with a common language. When fully adopted, it will make it easier for data developed in one discipline to be easily used in another.

Systems Approach to Training Analysis (SATA). This system builds on the terms developed for the Blueprint of the Battlefield, and guides training analysts and subject matter experts in analyzing the tasks performed on the battlefield. It is specifically designed to link task analyses performed as part of the CBRS with task analyses performed as a part of the SAT. The major thrust of this effort is to define a hierarchy of situation-specific tasks related to the generic tasks in the Blueprint of the Battlefield BOS. In general terms, tasks are defined at the following levels:

- Stated or implied missions - specific missions performed by a combat organization

- Collective tasks - components of specific missions

- Collective task steps - components of specific collective tasks (i.e., crew tasks)

- Individual/leader tasks - individual components of team tasks (i.e., position tasks)

- Individual/leader task steps - components of individual/leader tasks

This hierarchy of related tasks is developed in a top down manner. Missions are broken down into collective tasks, which in turn are broken down into finer detail until the steps required for each individual in a mission are identified. This type of task data will be of great value to training developers in that it will make it possible for the combat developer's concern for combined arms performance within the CBRS to be communicated clearly to the training developers using SAT. It should be noted that this hierarchy of task statements is being supported by the Automated Systems Approach to Training (ASAT).

The ITS Design for a new weapon system starts with the use of the CBRS, although little training-specific information is recorded at this time. However, the efficient transfer of appropriate data from CBRS to SAT is a goal that can be supported with programs such as TRASER, ASAT, BOS, and SATA.

Appendix I

Life Cycle System Management Model (LCSMM)

Appendix I
Life Cycle System Management Model

The Life Cycle System Management Model (LCSMM) is used whenever the CBRS process selects a major materiel acquisition as the means to solve problems identified in a Mission Area Analysis (MAA) and, subsequently, in the Battlefield Development Plan (BDP). The LCSMM is mandated by Army Regulation 70-1 (Systems Acquisition Policy and Procedures (AR 70-1), 1988). TRADOC Pamphlet 70-2 provides guidance regarding implementation of the LCSMM process (DARCOM-TRADOC (TRADOC Pam 70-2), 1984).

Figure I-1 presents an overview of the LCSMM process as depicted in Army Regulation 70-1. As shown on the figure, the process is divided into four phases by three major milestones. Milestones correspond to watershed decision reviews by the Army Acquisition Review Council (ASARC) and the Defense Acquisition Review Council (DSARC) in which the program is either halted, or approved to move to the next phase of development. Since training is correlated with the parent weapon system, it too goes through the same LCSMM process as an element of the weapon system. In LHX, for example, the ITS represents 18% of the total program and, therefore, is reviewed to the highest levels.

<u>Concept Exploration Phase</u>

The focus of the Concept Exploration Phase is to identify acquisition options, select the best option based on market analyses and CFP results, and develop an acquisition strategy that reduces cost, risk, and acquisition time.

This phase of the LCSMM process extends from Milestone 0 (which is the point of program initiation) to Milestone I. A new major program begins with approval of the Justification for a Major System New Start (JMSNS, or as is now referred to, the Mission Need Statement (MNS)) and the first major document produced for the new weapon system, the Operational and Organizational Plan (O&O Plan). The O&O Plan contains several highly useful items of information concerning training. First, it contains the initial description of the weapon system concept (Appendix M contains the LHX weapon system description from an early LHX O&O Plan). Second, the O&O Plan also contains a section on training which outlines the key features of the overall training strategy that will guide development of the ITS over the next 10-12 years. Appendix N contains the training section of an early O&O Plan for LHX. Third, the O&O Plan presents the users requirements for the system. At this time, the Program Manager for the project is named and the Program Manager's Office (PMO) created. In the LHX PMO, a specific representative for training was designated early in the program.

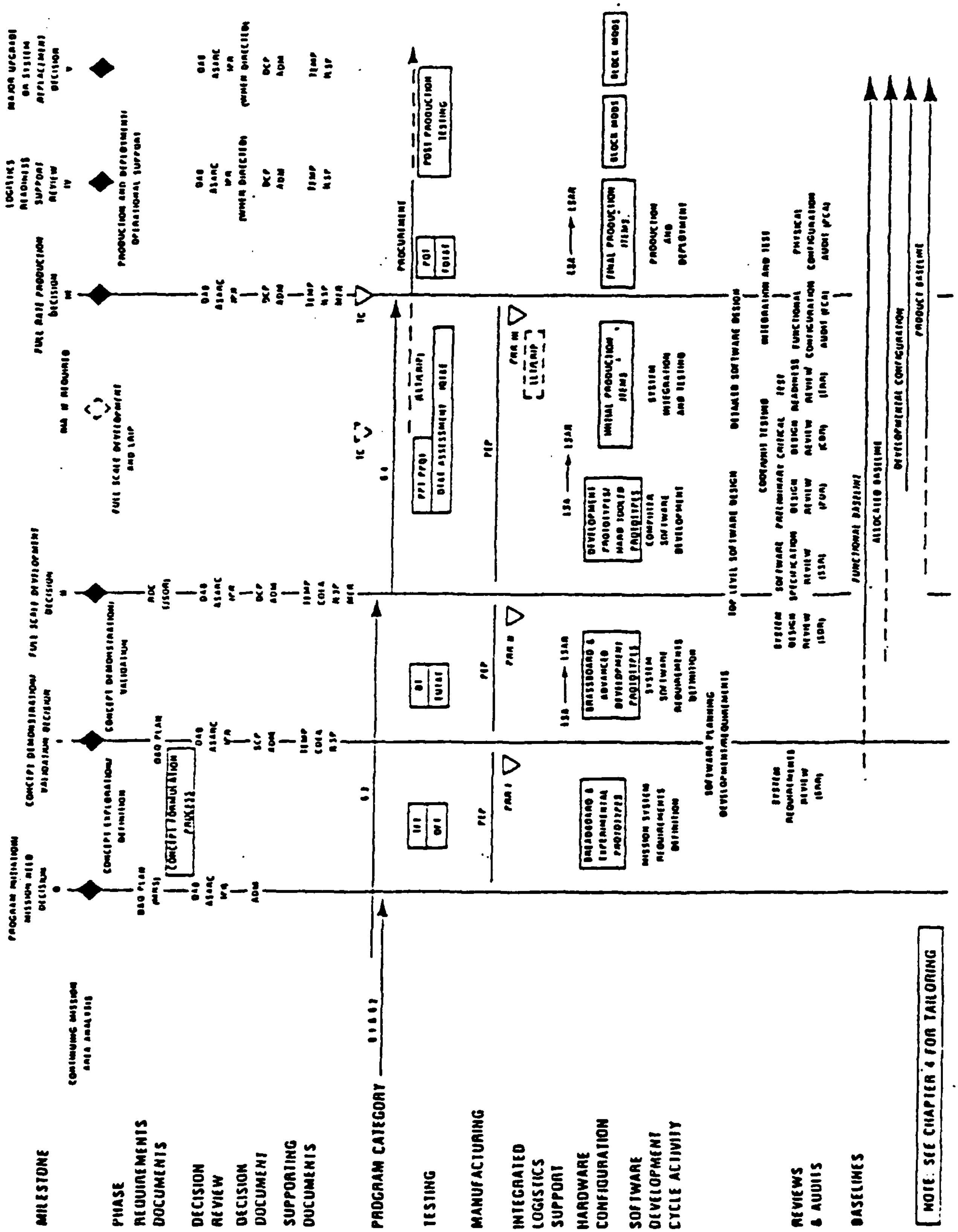


Figure I-1. Integrated Life Cycle System Management Model (LCSMM)

At this time, the Concept Formulation Process (CFP) for the weapon system design is begun. It culminates in the second phase, the Demonstration and Validation Phase of the LCSMM. As part of CFP, a Trade-off Determination (TOD) is made by AMC and a Trade-off Analysis (TOA) is made by TRADOC. As a result of the trade-off studies, a Best Technical Approach (BTA) is selected by AMC before the end of the Concept Exploration Phase. On the training side, the same process is carried out for the ITS to develop an initial notional training system design (using LHX terms). During this phase, both requirements and designs are refined through a series of risk reduction studies and further exploratory analyses. Contractors are given competitive contracts to further sharpen the analyses and new weapon system designs, bringing in their innovative approaches. At the end of the Concept Formulation phase, a Required Operational Capability (ROC) is written which sharpens the users requirements even more than the O&O Plan.

The Systems Specification is also produced near the end of this phase. It provides the best description of the emerging weapon system design this early in the LCSMM. Also, MANPRINT is initiated during this phase via the System MANPRINT Management Plan (SMMP). Based on a review of all the data, a positive Milestone I decision by the DSARC sends the program on to the next phase.

Demonstration and Validation Phase

Concept demonstration and validation activities focus on the steps necessary to validate the preliminary design and engineering. This is accomplished via additional trade-off analyses on technical, operational, MANPRINT, producibility, affordability, and supportability issues. A competitive prototyping effort may be used, if funds warrant such an approach. Risk assessments are conducted to identify and mitigate risks associated with the preferred design or alternatives. Modelling, simulations, and mockups are used to provide data to refine the design and further reduce risk.

During this phase, the CFP is completed by conducting a Cost and Operational Effectiveness Analysis (COEA) to define cost and effectiveness estimates for the options, including BTA. In training, a parallel process called Cost and Training Effectiveness Analysis (CTEA) is conducted on the ITS. During this process, documents such as the O&O Plan, ROC, System Specification, and other weapon system documents are updated, perhaps several times. As an example, the ROC for LHX has been updated six times in six years.

During this period, competitive contracts are awarded to design the new weapon system and its ITS. As a result of the

infusion of new ideas, many changes are made to the System specification which, in turn, affect the initial notional training design.

During Dememonstration and Validation new documents appear that are also very useful for training development. One of these is the Quantitative and Qualitative Personnel Requirements Inventory (QQPRI). The QQPRI document gives decisive information about the personnel to be trained and the scope of their job training. MANPRINT studies are performed during this phase which also help define human aspects of the new weapon system.

This phase concludes with Milestone II. A "go" decision by the DSARC sends the program onward to .ull Scale Development.

Full Scale Development

With a successful Milestone II decision, the program is authorized to go into Full Scale Development (FSD). During this phase, the new weapon system is "engineered, integrated, tested, evaluated, and documented to assure that the system is operationally effective and suitable, meets user requirements, and is ready for production. During FSD, the actual ITS is designed and produced, including training devices, by Contractors (except for Military portions of the system, such as tactics). Content and design of the ITS is driven by application of the Systems Approach to Training (SAT).

At the beginning of FSD, a competitive award to one contractor (team) is given to develop the system, including operating prototypes. At this point, many details of the design become concrete, enabling better design of training devices. With a successful Milestone III, the program moves into the Production phase.

Production Phase

This phase is marked by the beginning of full production of the weapon system and initial deployment. A critical milestone in this phase is "Initial Operational Capability", a point where the ITS is expected to be fully operational. Testing is conducted and feedback is provided to ensure that all aspects of the new weapon system, including training, work as planned. While there is no established completion point for this phase, its primary focus is on successful deployment and initial operation until the normal logistics and maintenance support can safely take over.

Interface Between Training and the Weapon System Development Process

The focus of this section is on the requirement for training personnel to ensure that the ITS maintains "concurrent design" with the emerging, changing weapon system throughout the LCSMM process. One of the goals of TRASER is to enable Army personnel to start development (or, at least conceptualization) of the ITS at or near Milestone 0. The data about the new weapon system design between Milestone 0 and Milestone II are very sparse and the data that do exist are tentative and sketchy in detail, compared to FSD design data.

Much of what is presented in this section draws on discussions and interviews with LHX personnel, both in Training at TRADOC and in Engineering at AVSCOM. This is not necessarily to advocate the LHX approach; rather, it is an attempt to draw useful ideas from the latest successful program in Army aviation and use them in the current effort. To support interviews, copies of available documents and their updates were requested and analyzed where possible.

Throughout the program the TRASER team assessed the applicability of data obtained from the aviation community to other Army proponencies. We did this using the expertise of recently retired Army officers who were available to the TRASER team. Although specifics vary across proponencies, it is felt that the issues presented below are generally applicable in the Army and that, therefore, aviation approaches and solutions are relevant elsewhere in the Army.

The Effect of Organization on the Interface Between Weapon System Design and Training. As part of the analyses associated with the conduct of this study, it has been noted that the Army has tried two approaches to training organization. In the most recent approach (LHX), the lead for training was placed in the Program Manager's Office, giving training very high "visibility" on the LHX project. On other earlier projects (e.g., AH-64), the lead for training was assigned to the New Equipment Training (NET) group at AVSCOM, which is part of the Directorate of Maintenance. Even though the NET group is part of AVSCOM, they are located in a remote part of the facility, well away from the PMOs. This remote position makes the NET less accessible to day-to-day project activities than a training entity within the PMO. Training developers at Ft. Rucker are even more remote from day-to-day PM activities, consequently they are delayed from learning about training-relevant events by sometimes weeks or even months. Remote personnel learn to use personal contacts within the PMO or within AVSCOM to learn about details of project development, such as weapon system design. Major events are communicated via memos or other documents, but these messages can take quite a while to clear official hurdles and "get out".

The LHX ITS development has been located directly in the PM/LHX office. This person draws support from the New Equipment Training group at AVSCOM and the DOTD personnel from TRADOC at Ft. Rucker through the LOA between AMC and TRADOC. Within the PM/LHX, the Program Manager for Training (PM/T) has complete and total access to needed data for training. This access has been used to keep the other training personnel well informed.

Regarding organization for training and access to weapon system data, the conclusion can be drawn that the closer the lead for training is to the PM office, the more access the training community has to design documents and design decisions. While this seems like a straightforward conclusion and not very startling, it does underline the point that "remote" Army personnel (i.e., those at Ft. Rucker or even at the NET group at AVSCOM) do not always have access to critical data on a timely basis, even though procedures have been created to provide that access. This problem can be addressed by TRASER and its databases.

Weapon System Design Data During LCSMM Phases. Those responsible for ITS development have been charged with ensuring that ITS elements, particularly large simulators and training devices, match the weapon system in hardware and software configuration. This requirement is based on the premise that the more similar ITSs are to the parent weapon system, the more they will yield positive transfer of training to the real world.

Maintaining this "concurrent design" for 10-12 years in today's technological age for a new, emerging weapon system is very difficult. Part of the difficulty stems from the fact that technology is changing so rapidly that today's technology may be nearly obsolete 10-12 years from now when the weapons system is fielded. To counter this problem, design engineers throughout the early phases of weapon system development are constantly seeking new technology to incorporate into the design to forestall obsolescence. Laboratories in the DoD community are constantly producing new technology for the engineers to apply. Added to this factor pushing for change is the competitive procurement process in which contractors seek technological improvements that will distinguish their design over competitors and enhance their chances of winning the procurement. On top of this tremendous stimulus for design change is the critical need to offset perceived enemy technological advances in their warfighting capability.

The result, weighed against cost and risk, is an evolving weapon system design that changes up to a "design freeze" point where the design actually goes into production. Even then, the design is modified through ECPs or Product Improvement Proposals

(PIP) so that different blocks of a weapon system have slightly different designs. The challenge to training personnel is to somehow track these changes, filter out those that do not bear on ITS development, and produce an ITS by IOC that matches the design of the weapon system.

In the interviews conducted as part of this study, Army training personnel were asked about their access to weapon system design information at all phases of development. These data were recorded and marked for position within the Army new weapon system organization. The data indicated that changes to the weapon system design early in the program often were detected by the training community outside of the Program Managers Office weeks or even months after they occurred. On older programs (e.g., AH-64), sometimes training personnel did not detect the changes at all. In some cases, "limited access" restrictions on certain data prevented access to critical data needed for analyses. After analysis of the interview data, one can safely conclude that the closer that training personnel are to the Program Manager's Office for the new weapon system, the more apt they are to know about details of weapon system capability.

Documents Produced During LCSMM

The following paragraphs describe the contents of various weapon system requirement and design documents during the 10-12 year LCSMM process. Frequent reference is made to the LHX program as an example of the process.

Concept Exploration Phase. During the very early periods of weapon system development, both requirements documents and design documents contain design information about the emerging weapon system. At the outset (Milestone 0), the only credible design information about the weapon system is contained in the O&O Plan, which is a requirements document. Appendix M contains a sample weapon system description from an early version of the LHX O&O Plan.

As shown in Appendix M, the Operational Plan portion of the overall plan indicates the environment that the LHX is intended to operate within, the sensors that it must avoid, the type of operations that it will perform, and the missions that it is intended to perform. It also describes some of the differences that are planned for the attack, scout, and utility versions of the LHX. These alternative versions of the LHX had a major impact on the strategy for ITS development, embodied in the training annexes to the O&O Plan. As shown in Appendix M, the detail of LHX design is functional in nature. The missions provide a clue as to some of the mission equipment packages (MEP) that are to be included in the LHX design. The main point here is that this Appendix represents what the training personnel know about the weapon system at the very earliest point in development.

The next item of information that training developers can obtain is MEP descriptions. These packages describe the mission-oriented equipment, particularly avionics, that will be installed in the aircraft. By analyzing these MEPs, the training personnel (and MANPRINT personnel) begin to deduce what the crew will have to do on various missions. These assumed tasks then are related to historical tasks from a previous, similar weapon system. In the case of the LHX, DOTD personnel indicated that they used AH-64 and OH-58D task data to make the extrapolation initially. As time passes and the design becomes clearer, these "notional" tasks are reviewed several times to ensure accuracy and completeness.

The next major item of useful information about the Weapon system design comes from the TOD. As AMC and TRADOC create alternative designs, design documents become available to training personnel. Unfortunately, copies of the first TOD designs could not be located in LHX files for use in this report so little can be surmised about them except to say that they are first engineering- oriented design documents with some detailed data.

Following the TOD are the TOA, BTA, and COEA processes involved in CFP. This CFP process can cover up to four years to complete for major weapon systems, thus extending into the next phase of the acquisition process. During this period, the designs narrow in specificity and more engineering detail can be extracted from the design about human tasks and training requirements. As MEP are identified, actual task data can be derived in several ways, enabling application of SAT methodology.

At the end of the Concept Exploration Phase, the ROC is developed which indicates the users requirement for the weapon system. Depending upon the approach taken, the ROC may have some design information or it may be completely devoid of design data. At the same time, the Program Manager/Engineering releases the initial version of the System Specification (SS) which is a fairly detailed description of the new weapon system. Copies of the earliest SS for LHX were not available for inclusion in this report. Much of the design work for LHX engineering is being done at Ft. Ord and transmitted to AVSCOM on a daily basis. LHX engineers indicate that as many as 350 design changes have emanated from the group at Ft. Ord during the life of the LHX. These documents, plus personal contacts with design engineers and contractors, represent what the training developer has to work with at this early stage.

<u>Demonstration and Validation Phase</u>. During this phase, the CFP process is completed and all requirement and design documents are updated as needed. This revision is evidenced by six changes to the SS and about three changes to the ROC for LHX.

The most recent version of the SS was available and provided by the PM/Engineering for LHX to show the extent of its current design. The June 1988 version is 140 pages long. The specification part is 61 pages long, with breakouts for scope, reference documents, requirements, system description, air vehicle systems, MEP, software, system integration, deployability, integrated mission planning equipment, and PIPs. Other sections concern training, RAM/ILS/CALS, producibility/ production competition, and Testing. Of specific interest to training and MANPRINT is a section of the specification dealing with control and display requirements. Here specific man/machine interface issues are addressed, such as helmet-mounted sights and voice input/output requirements. These new technology factors affecting the crew must be included in the conceptualization of the ITS. Another feature which has training implications is "retractable landing gears". The point here is that six years into the program, training personnel can get a good perspective on crew factors from the SS.

Also during this period, competitive teams of contractors are developing designs to meet the SS. These competitive efforts serve to sharpen the designs and reduce risk. Because of the ongoing competition for LHX FSD, copies of contractor design documents were not available for review in this study.

Full Scale Development. In this phase, the design effort shifts to the weapon system prime contractor whose engineers create the winning proposal in response to the ROC and the procurement package which includes an RFP. In this phase the ITS design is transformed into a real ITS by the contractor or its training subcontractor. The Government reviews, and accepts or rejects the contractor's effort. Portions of the ITS dealing with military application of the weapon system, such as tactics courses, are developed by TRADOC schools during this period. Thus, most of the interface between training and the design engineers occurs within the contractors organization.

Production Phase. In this phase, design documents basically reflect changes to the initial production weapon system. These changes take the form of ECPs, Product Improvement Programs (PIP), and Preplanned Product Improvement Programs (PPIP), as well as feedback from initial implementation and T&E. Training personnel in the Army detect these changes through Configuration Control Board actions for each model aircraft or from T&E reports. Neither Configuration Control Board documents nor T&E Documents were available for inclusion in this study, therefore, their exact content is unknown. However, because of the nature of an ad hoc change, training developers were reported to have little notice or reaction time to assess the impact of the change on the fielded ITS and make necessary changes.

Appendix J

Database Requirements

Appendix J
Database Requirements

The concept for the design of the supporting database for TRASER was approached with the general philosophy that form follows function. The complete set of IDEFo diagrams was examined to determine general data and information functions. Two conclusions can be stated from the analysis of the IDEFo diagrams and the process they support. The conclusions are that (1) there are three different data forms of internal, centralized information sources needed to support an automated TRASER, and (2) data flow in training system design is disjointed, with a lack of a mandated format or content at any given point in the life cycle of the weapon system. Each of these conclusions is discussed further in this section.

TRASER Internal Information Sources

Three types of internal information sources are needed to support a TRASER-like system. First, knowledge bases composed of rules that capture both information and procedure are needed to effectively use information for criteria judgments and optimization decisions. Although identified for emphasis and clarity as inputs in the IDEFo diagrams, criteria and optimization prompts are not transformed by the associated activity (e.g., A0141, Perform Cost/ Training Effectiveness Analysis). Knowledge bases of expert rules are also indicated for determining training effectiveness, rough order of magnitude costing, (e.g., A0141, Compute Cost Data for Alternative ITS Designs), validity assessments, embedded training decisions (A01323333, Design Optimal Embedded Training for MOS Unit Training), and other automation of judgments, such as best technical approach selection, (A01343, Select Best Technical Approach (BTA) ITS Design). Since there are no metrics for training effectiveness agreeable across the training community, heuristics appear to be the only manner suitable for addressing the automation of such analyses. Similarly, optimization appears to be without metric and philosophy across its intended use, and must also be handled by suitable heuristics. Knowledge bases are the only potential technology for assigning confidence measures to the data used in TRASER.

The second type of information necessary for TRASER is an image base system. Large volumes of freeform text are generated both by the weapon system developers and the training developers. Most LSCMM documents are in this category. To allow timely distribution and concurrent use, an image based system where pictures of each document page are stored and retrieved is suggested. Another alternative would be a hypertext-type system where links between related words or sections of documents or other documents would be maintained. Such a key word system is difficult to maintain and there is little demonstrated use of such a system in weapon system development. In addition, the ease and low cost of making an image versus the higher cost of scanning, editing, and linking text, with

questionable added value to a hypertext solution, suggests an image base. Commercial image systems that handle insurance paperwork and hospital records are in use, thus the technology risk is lower with an image system solution. CBRS data, the Battlefield Development Plan (BDP), message traffic, new weapon system technical reports, archive copies of LCSMM documents, draft copies of technical manuals, and unit SOP's are all candidates for storage in an image system.

The third type of data store needed for TRASER is a relational database system. This database management system would handle structured information that would be usable across several disciplines. New weapon system data, in the form of the LSAR, is projected to be in a relational form by CALS Phase 2, which starts in FY 92. TRADOC's training management data, as well as data from individual TRADOC schools, will be in a relational form when all of TRAMOD is in place. Data and information classes that should be stored for TRASER use in a database management system are MANPRINT data, LSAR data, HARDMAN data, WBS cost data, task data, training system element data, and design tool outputs, such as ASAT and OSBATS.

Several organizational schemes for the database are also suggested from the TRASER analysis. Weapon system data should be available from the program manager in MIL STD 1388-2B form. Cost data should be available and organized around a work breakdown structure. ASAT will provide data organized around tasks, drills, and ARTEP's. Whenever possible, data should be maintained in TRASER in the same format as the source of that data collects and maintains it. The database design problem then shifts from creation to integration with a resultant risk and cost reduction.

General implementation considerations across all three types of data stores are the maintenance of data independence, data integrity, and data security, while insuring data sharing, controlled redundancy, and minimization of changing data formats for various TRASER processes. The use of commercial products for all three types of data stores is suggested. Confidence in the use of the data in various TRASER processes must also be considered when interfacing the data stores with the TRASER automated processes.

Basic Design Steps For Data Stores

While basically the designs of information systems are similar, the three different types of data stores have specific considerations that are addressed below.

Several knowledge bases are suggested by an examination of the TRASER IDEFo diagrams. Checking for validity and completeness in embedded training decision making are two examples. In general, all knowledge bases follow the same set of design steps. The steps are to first determine the problem domain limits, then determine the best knowledge representation scheme, such as rules or frames.

Third, is to determine the best confidence scheme. If no viable confidence scheme is identified for the knowledge base, or all data are of equal confidence, a decision tree application offers a much simpler specific solution. The fourth step is to determine the rules or slots and assemble the knowledge base. The last step is to test and refine the knowledge base with several test cases representing the extremes of the potential actual case range. Depending on the choices for TRASER modernization, automation, and intervention, an integration step might be necessary.

There are five steps for consideration in image base design. The first is to determine membership criteria for inclusion. Storage of entire LCSMM documents or only training segments must be decided. High bulk items, such as technical manuals, should be evaluated for inclusion. Second, a retrieval scheme and header information must be determined. The principle decision will be whether to offer the user information by document-only retrieval or allow text string searching. Time and original source stamping are also necessary. The next step is to determine on-screen presentation formats. This is often a mute point as most commercial systems allow only a limited selection of screen or split screen presentations. The next step, the most important cost driver, is to determine the distribution media and frequency of update. Due to the desire for an audit trail, write-once/read many optical media are suggested. The final steps are to implement, test and integrate.

The design of the relational database involves both creation and integration. The first step is to examine the IDEFo diagrams of the sections determined to be suitable for intervention points and determine the basic entity classes represented in the data. The next step is to determine what makes each database record for that entity unique. This is a key. Then, it is necessary to model the relationships between the entities chosen, and model the attributes of the entities to determine the data elements for each entity class. The next integration step is to match this attribute description to data sources in order to define and leverage existing formats and definitions. The final steps are to implement, test, integrate, and document the database design. As there might be several sources for a particular data element, a precedence hierarchy is necessary to resolve conflicting formats.

Precedence Hierarchy For Database Element Descriptions

In order to establish detailed, unique definitions of TRASER data that are as useful and as practical as possible, a precedence order for data element descriptions is required. Such a precedence order is discussed in the following paragraphs.

The first order of precedence is TRASER unique definitions. These are terms that are operationally defined with definitions similar to common usage, but have exact definitions for the TRASER project. These are terms, such as training requirements, training

system design elements, training system, integrated training system, training system optimization strategy, training system design, training concept, training philosophy, and training risk areas. Due to TRASER's comprehensive and life-cycle usage, these unique definitions are necessary. These terms are defined in Appendix F.

The second order of precedence for data formats is MIL STD 1388-2B data items. This recently updated MIL-STD for ILS data elements will be used for all data items that are defined for ILS/CALS. These include data elements, such as tasks and related information, weapon system descriptive information, and associated training device descriptions when included as a component of the weapon system project. This precedence decision was made in recognition of the life-cycle nature of TRASER, the need for obtaining data easily from existing weapon system projects, and interchanging data from one set of principle users to others (e.g., task data from the PMO to TRADOC training developers and back.

The third order of precedence is the ASAT data element description. ASAT is potentially the largest production data source of generalized collective and unit training data. It is also the most probable source of historical data from similar weapon systems or subsystems.

The fourth order of precedence is the TRAMOD data element description. TRAMOD is the largest potential source of resident training course data and other schoolhouse information. It is discussed later in this appendix.

The fifth order of precedence is other existing ARI projects. This includes OSBATS, MANPRINT tools, and any other relevant research efforts. Cost data elements in a suitable breakout of product (by WBS) or resource (TRADES, TRACES, etc.) will probably be borrowed whenever the complete costing methodology for TRASER is determined. Systems containing training system performance data developed for research use will also be examined since there are currently no standard data elements for training performance measurement.

The use of this precedence for determining data element descriptions and formats will improve model conciseness. It will also aid in the generation of test data sets for the TRASER intervention point prototypes.

Data Source Format Precedence Example. In order to explain the use of a format precedence, the following example is presented. The requirements for input data category, New Weapon System Data, specifically, Training System Requirement changes, comes from IDEFo diagram A03, Develop and Evaluate Actual Training System. From the precedence list, ICWS DB/CALS is the data source with the highest precedence that has a suitable format. From the ICWS DB/CALS format description, which is MIL STD 1388-2B, a suitable format is obtained in Table GA, New or Modified Skill (see Figure J-1). When

Table GA New or Modified Skill

This table contains information about new or modified skill requirements.

Data Elements:

85	DTY_PSTN_RQRN_A_NW_OR_RVSD_SKL	DPRNRSGA	19 X L -
178	SKILL_LSA_ITEM_SRUCTURE_CODE	LCNCODGA	18 X L - M
88	SKL_RQRNG_END_ITEM_ACRNYM_CD	EIACODGA	10 X L - M
328	SCRTY_CLRN_RQRD_FR_SKL_SPCL_CD	SCRSSCGA	1 N F -
257	SKILL_REQUIRING_PERSON	SKRQPEGA	2 X F -
342	MODIFIED_OR_CREATED_SSC	MDCSSCGA	7 X L - M
341	MODIFIED_OR_CREATED_SLC	MDCSLCGA	1 A F -
359	TEST_SCORE	SSCTESGA	3 N R -
342	OLD_SKILL_SPECIALTY_CODE	OLDSSCGA	7 X L -
361	SKILL_REQUIRING_SUBTASK	SKROSUGA	3 N F -
374	SKILL_REQUIRING_TASK	SKROTAGA	7 X F -
19	SKL_RERNG_ALTRNT_ITM_CD	ALTLCNGA	1 X F - M
181	SKL_RQRNG_LS_ITM_STRCTR_TYP	LCNTYPGA	1 A F - M
295	RCM_RNK_RT__PLN_GRD_CVL_GRD	RPPCIVGA	4 X F -
7	ADDITIONAL_SKILL_REQUIREMENT	ADDSKLGA	5 N R -
259	PHYSCL_AND_MNTL_RQRMTS	PHYSMEGA	5 N R -
87	EDUCATIONAL_QUALIFICATIONS	EDUCATGA	5 N R -
12	ADTNL_TRNNG_RQRMNTS	ADDTRNGA	5 N R -
166	NW_OR_RVSD_SKL_JSTFCTN	NRSJUSGA	5 N R -

A- alphabetic data field
N- numerical data field
X- text data field
D- floating point decimal data field
justification- Right, Left, or Fixed
decimal placement
extended narrative data fields "5 N R -" pointer to BLOB
M- manditory, not null

Figure J-1, MIL STD 1388-2B, appendix A, LSAR relational data tables.

information on training system requirement changes, due to changes in the weapon system, is obtained from the weapon system program office, it should already be in this format. When the information comes from another source, such as TRADOC's ALLMIS, it will have to be reformatted to match the chosen format, but most of this type of information should come from the project office. Using this precedence list, TRASER implementers can determine common formats that minimize data reformatting and maximize the use of existing information.

Data Sources

Based on the analysis of TRASER IDEFo diagrams, several major classes of information were identified. Current training system data will serve as historical data for new weapon system development. They will be available through TRADOC's TRAMOD. Weapon system design data will be available in a standardized format from LSAR, CALS, and the evolving program manager's individual project Integrated Comprehensive Weapon System database. Training technology data will be available from TPDC. ASAT, which in the future will be part of TRAMOD, will be a source of individual and collective task information, as well as unit drill and ARTEP data. The project management office is the primary source for the majority of LCSMM documents. Data collected for or created as a result of MANPRINT analyses, such as HARDMAN or Early Comparability Analysis, are available from the TRADOC proponent school training development directorate. The largest volume source of detailed information will be from TRADOC and is described in the discussion of TRAMOD later in this appendix. The viability of meeting classes of TRASER data requirements is largely based on the assumed availability of TRAMOD and CALS. Figure J-2 illustrates the match between TRASER IDEFo generated data requirements and TRAMOD/CALS as data sources.

TRAMOD

TRAMOD is a training information management architecture that integrates approximately thirteen automated information systems within the TRADOC environment. Each information management system has a proponent office in TRADOC and a unique set of data to be maintained with regard to Army training development, implementation, evaluation, and support. Figure J-3 summarizes the systems that constitute TRAMOD and that are discussed below. The following paragraphs provide descriptions of each of the thirteen information systems.

Army Extension Training Information System (AETIS). This information system is maintained at the Army Training Support Center at Fort Eustis, Virginia. It consists of several application programs which are used in the management of the training development workload and the installation contract process for the Deputy Chief of Staff and Training (DCST), TRADOC HQ, Ft. Monroe, Virginia. The system integrates training products, requirements, and services into the Army training inventory to provide management

IDEFo Data Category Name	Primary Source
A-0 Produce and Refine Optimal Integrated Training System Design	
New Weapon System Data	Weapon System Project Office, ICWS DB / CALS
Historical Data	TRADOC MIS
Training Technology Data	TRADOC, ATSC; DoD TPDC
MANPRINT Data	TRADOC MIS
ASAT Data	TRADOC MIS
OSBATS Data	PM TRADE
Existing Training System Elements	TRADOC MIS
A0 Produce and Refine the Integrated Training System Design	
New Weapon System Data	
Training System Requirement Changes	Weapon System Project Office, ICWS DB / CALS
Historical Data	TRADOC MIS
Training Technology Data	TRADOC, ATSC; DoD
TPDC	
MANPRINT Data	
Training System Requirement Changes	TRADOC MIS
ASAT Data	
Training System Requirement Changes	TRADOC MIS
OSBATS Data	
OSBATS Output	PM TRADE
Existing Training System Elements	TRADOC MIS
Training System Requirements	A01
Training Optimization Strategy	A01
Initial Notional Training System Design	A01
Cost / Training Effectiveness Analysis	A01
Training Cost / Effectiveness Estimates	A02
LCSMM Documents	A02
Baseline ITS Design	A02
Post Fielding Evaluation Summary	A03
Projections of Future Requirements	A03
Material Fielding Plan	A03
Projections of Future Requirements	A03

Figure J-2 Input Data for TRASER

Training System Elements	A03
Actual Training System Design	A03

A01 Develop Initial Notional Training System Design

New Weapon System Data	Weapon System Project
	Office, ICWS DB / CALS
Training System Requirement Changes	Weapon System Project
Office, ICWS DB / CALS	
	TRADOC MIS (ALLMIS,
CTC Archive)	
New Weapon System Description	A011
Historical Data	
Historical Weapon System Data	other Weapon System
	Project Offices' ICWS DB
CMF/MOS Data	TRADOC MIS (AETIS)
Historical Training System Data	TRADOC MIS (RMIS,
AIMS, ATTRS)	
Training Technology Data	DoD TPDC
BTA Selection Criteria	TRADOC MIS (AIMS)
MANPRINT Data	
Training System Requirement Changes	TRADOC MIS (CTC
	Archive)
Training Messages	TRADOC MIS (TRAMOD
Executive System)	
Optimization Data	TRADOC MIS
ASAT Data	
Training System Requirement Changes	TRADOC MIS (ASAT)
ASAT Output	TRADOC MIS (ASAT)
OSBATS Data	
OSBATS Output	PM TRADE (OSBATS)
Existing Training System Elements	TRADOC MIS (ADAM,
	TREDS-NRI, ARTMIS,
	AETIS)
Training System Requirements	A01
Notional Training System Requirements	A011
Training Optimization Strategy	A01
Training System Optimization Strategy	A012
Initial Notional Training System Design	A01
Alternative Training System Design	A013
Cost / Training Effectiveness Analysis	A01

Figure J-2 Input Data for TRASER

Cost / Training Effectiveness Data	A014
Notional Training Requirements	A011
Training Cost / Effectiveness Estimates	A02
LCSMM Documents	A02
Baseline ITS Design	A02
Post Fielding Evaluation Summary	A03
Projections of Future Requirements	A03
Material Fielding Plan	A03
Projections of Future Requirements	A03
Training System Elements	A03
Actual Training System Design	A03

A02 Refine Baseline Integrated Training System Design

New Weapon System Data	Weapon System Project Office, ICWS DB / CALS
Current NWS Data	Weapon System Project Office, ICWS DB / CALS
NWS Program Messages	Weapon System Project Office, ICWS DB / CALS
MANPRINT Data	
QQPRI Data	TRADOC MIS (AETIS)
LSA Data	Weapon System Project Office, ICWS DB / CALS
HFEA Data	Weapon System Project Office, ICWS DB / CALS
Target Audience Description	TRADOC MIS (TDWS)
ASAT Data	
ASAT Output	TRADOC MIS (ASAT)
Exercises	TRADOC MIS (ASAT)
OSBATS Data	
OSBATS Output	PM TRADE (OSBATS)
Training System Requirements	A01
Initial Notional Training Requirements	A01
Training Optimization Strategy	A01
Optimization Data	A01
Initial Notional Training System Design	A01
Cost / Training Effectiveness Analysis	A01
Notional ITS CTEA Report	A01
Cost / Effectiveness Data	A01
Cost / Effectiveness Criteria	A01

Figure J-2 Input Data for TRASER

Baseline ITS Design	A02
Baseline Integrated Training System Design	A025
Revised Task Assignments	A024
Training System Changes	A025

A03 Develop and Evaluate Actual Training System Design

New Weapon System Data	Weapon System Project Office, ICWS DB / CALS
Training System Requirement Changes	Weapon System Project Office, ICWS DB / CALS
Training Technology Data	
Existing Inventory of Aids and Devices	TRADOC MIS (ADAM)
MANPRINT Data	
Training System Requirement Changes	TRADOC MIS (ALLMIS)
ASAT Data	
Unit Collective Training Tasks	TRADOC MIS (ASAT)
Existing Training System Elements	
PM Developed Training System Elements	Weapon System Project
Office, ICWS DB / CALS	
TRADOC Developed Training System Elements	TRADOC MIS (TREDS-NRI, AETIS)
Training Cost / Effectiveness Estimates	A02
Cost / Effectiveness Data on Task Training Methodologies	TRADOC MIS (RMIS)
LCSMM Documents	A02
Milestone Review Documents	Weapon System Project
Office, ICWS DB / CALS	STRAP
	TRADOC MIS (AETIS)
Baseline ITS Design	A02
Post Fielding Evaluation Summary	A031

A04 Support Implementation of Training System Design

New Weapon System Data	
Training System Requirement Changes	Weapon System Project Office, ICWS DB / CALS
MANPRINT Data	
Target Audience Description	TRADOC MIS (TDWS)

Figure J-2 Input Data for TRASER

Existing Training System Elements	
Available Training System Elements	TRADOC MIS (AETIS, TREDS-NRI)
Training Cost / Effectiveness Data	TRADOC MIS (RMIS)
Performance Data	A041
Post Fielding Evaluation Summary	
Projections of Future Requirements	A03
Material Fielding Plan	
Projections of Future Requirements	A03
Actual Training System Design	A03
Currently Implemented Training System Design	A041
Training System Design Data	A042
Deficiences	A042
Improvements and Cost Data	A043
In-process Changes	A044
New or Revised Training System Elements	A044

Figure J-2 Input Data for TRASER

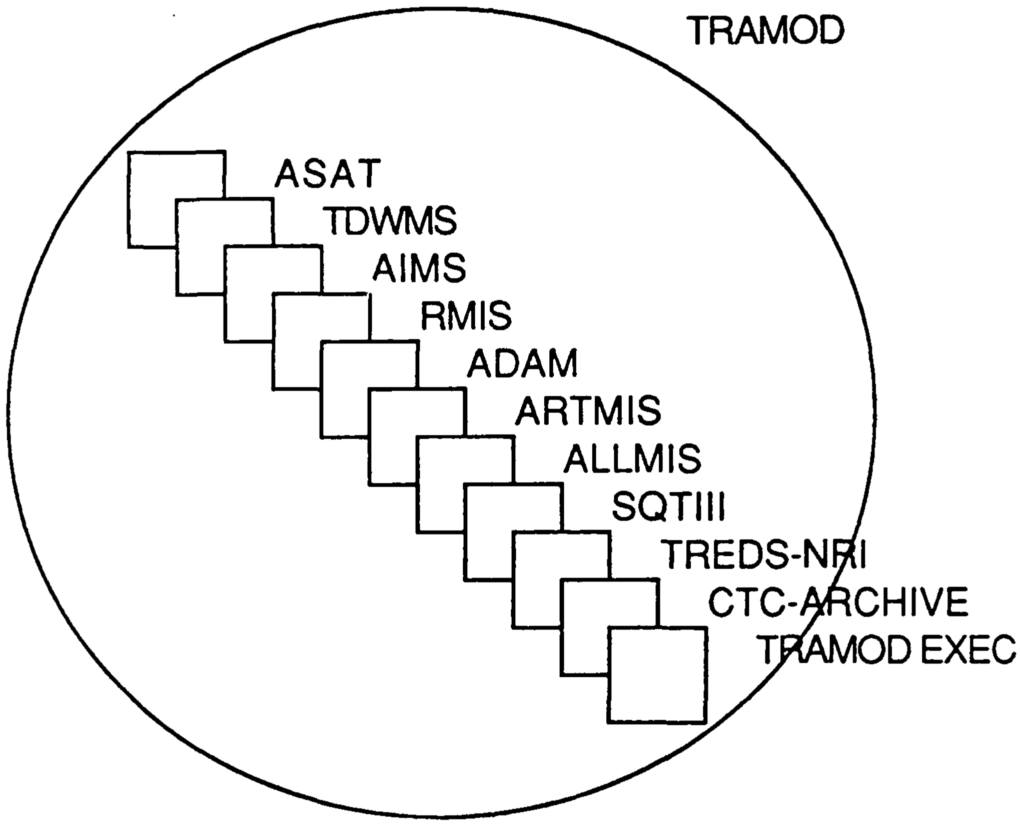


FIGURE J-3. Overview of TRAMOD system

information by unit, system, military occupational specialty (MOS), and job. AETIS forecasts resource requirements for validated training and development efforts related to training material production. DA funding to Army service schools is based upon workload requirements reported and retained with AETIS. AETIS has access to 22 TRADOC schools. AETIS has the ability to provide management of the Army-wide Doctrinal and Training Literature Program, to provide publication print schedules, to establish resource accountability of the installation contract annex and quarterly assessment processes, and to manage inventory and world-wide distribution of Army Training Extension Course material.

AETIS currently exists at the Fort Eustis Directorate of Office Information Management and resides on a Unisys A10, providing centralized system computing support. There is a combination of Burroughs data entry terminals with printers, and MS-DOS compatible PCs running Burroughs protocol emulation firmware in use throughout the schools, integrating centers, ATSC, and HQ TRADOC.

Current plans call for AETIS data to be accessed to and from the Installation Support Modules and other TRAMOD systems. Available alternatives are currently being evaluated concerning integration of AETIS within the TRADOC Decision Support System (TDSS). Current plans are to replace AETIS with the Training Development Workload Management System (TDWMS) in FY 92.

The type of data that can be accessed from this information system and the regulatory document are:

- o Centralized management of training support programs and integrated training subsystems (TR Reg 350-7, Systems Approach to Training).
- o Training development workload validation for program analysis of resource requirements (PARR) and TRADOC review of manpower (TRM); and products related to the individual training plan (ITP) and the systems training plan (STRAP) (TR Reg 351-1, Training Requirements Analysis System).
- o Task analysis and requirements identification (TR Reg 351-4, Job and Task Analysis).
- o Needs analysis and media selection, requirements integration and prioritization, training development management, and product management for extension training (TR Reg 351-6, Support of Training in the Units).
- o MOS training plan support and general subject training support (TR Reg 35-11, Soldier Training Publications (STP Policy).
- o Installation contract annexes and quarterly assessment (TR Reg 11-4, Installation Contract System).

- o Mission area analysis and development plan, and doctrinal literature program management (TR Reg 11-7, Operational Concepts and Army Doctrine).

- o Armywide doctrine and training literature print schedule and publication inventory management (AR 310-3, Preparation, Coordination and approval of DA Publications).

- o DA audiovisual production program and Defense audiovisual information system interface (AR 108-2, Army Training and Audiovisual Support).

The AETIS system generates the following reports:

- o Training requirements based computations
- o Installation contract annex summaries
- o Training development quarterly assessments
- o Individual training plan listings
- o Individual and collective training plan or STRAP listings
- o Master product report selections
- o Availability reports
- o Army training literature reports
- o Extension training catalog reports
- o MOS reference reports
- o FY-sequence number reference reports
- o Status media summary reports
- o Extension training material additions/deletions management reports
- o Resource requirements summary reports
- o Master index report selections

These reports are generally a listing of products by product code numbers, sequence numbers, functional type, status, and fiscal year. The Training Program Worksheet is the data input into the AETIS for each product. This information is entered into the AETIS for each proponent school by representatives of the Program Development and Management Office.

Training Development Workload Management System (TDWS). This system, as upgrade of AETIS, will integrate training products, requirements, and services into the Army training inventory to provide management information by unit, system, MOS, and duty position. It will forecast resource requirements for validated training and development efforts related to training material production. The system is currently being designed and developed with an anticipated TRADOC-wide implementation by FY 91. This initiative will create a TDWMS database as an integrated system within the Training Module of the TDSS. It will replace the existing AETIS in FY 92.

Automated Systems Approach to Training (ASAT). ASAT will provide training developers in the Army service schools and integrating centers with an automated tool to improve training development efficiency and responsiveness. This initiative will automate all five phases of the Systems Approach to Training as a submodule to the TDSS TRAMOD. A fully integrated ASAT, combining collective and individual training development, will support the development and management of all Army training development processes and products. ASAT covers the training development plan, the SAT analysis phase, and Training Plans, Drill Books, Soldier's/ MQS manuals data, lesson outlines, POI data, and resident training resource requirements. The collective task portion of ASAT is currently being developed and prototyped at the Logistics Center, Ft. Lee, Virginia. The individual task potion of ASAT is scheduled to be developed and prototyped at the Quartermaster School, Ft. Lee, Virginia during FY 91.

Automated Instruction Management System (AIMS). The AIMS is a resident training management system for the purpose of automating student information for resident instruction at 21 TRADOC schools and training centers. The AIMS consists of following major functional areas: personnel management, student gradebook management, aviation records management, quota control management, test and evaluation management, resource scheduling, student critique process, and queries process. Each proponent school operates AIMS independently on a dedicated VAX 11-750/785. AIMS was initially fielded in FY 84. A common integrated database is the heart of the AIMS concept.

Each of the three systems, AIMS, ASAT, and TDWS, has information that can be used by the other systems, as well as housing its own unique data. These three systems are valuable potential data sources for TRASER and can in turn be provided by data by TRASER.

Executive System. This initiative will provide the Program Manager of TRAMOD with a system to support the program management, configuration management, and data administration responsibilities in support of TRAMOD. This module is in the conceptual planning stage and completion is anticipated for FY 91.

Resource Management Information System (RMIS). This system manages the ATSC budget and management requirements. RMIS was initially fielded in the FY 77-79 timeframe. There is a combination of Burroughs data entry terminals with printers and MS-DOS compatible PCs running Burroughs protocol emulation firmware in use throughout ATSC. There are tentative plans to connect the Unisys A10 mainframe to the installation TISI mainframe. Current plans call for using the existing IBM 9375 as an SNA gateway through a T1 circuit to the installation TISI mainframe. There is an ongoing procurement action to provide an SNA emulator/front-end processor for the Unisys A10 mainframe. Once the SNA gateway is operational and the SNA emulator/front-end processor is procured and operational, and the IBM 9375 is connected to the processor, there will be the ability to access RMIS data to and from the Installation Support Modules (ISM) and other TRAMOD systems. The requirements for integrating the RMIS within the TDSS communications network are currently being evaluated.

Skill Qualification Test (SQTIII). SQTIII is another automated system located at ATSC. It supports the Individual Training Evaluation Program (ITEP). It supports the world-wide scoring and reporting in the Active Army, Army Reserve, and National Guard enlisted soldiers on the Skill Qualification Test (SQT). It is operational on the UNISYS A10 mainframe at Ft. Eustis. SQTIII provides scoring and feedback on SQT results. The Automated SQT scoring systems were initially fielded in the mid 70's. There is a combination of Burroughs data entry terminals with printers, and MS-DOS compatible PCs running Burroughs protocol emulation firmware in use throughout the schools, integrating centers, ATSC, and HQ TRADOC. Plans call for this system to be connected to the installation TISI mainframe. Eventually there will be the ability to access SQT data to and from the ISM and other TRAMOD systems.

Army-Wide Devices Automated Management System (ADAM). The ADAM system serves as a tool to assist the Training Support Centers (TSC) and ATSC in developing and maintaining an inventory of training support materiel. The system supports 46 plus TSCs world-wide. The system tracks fielded TDA training devices listed in DA Pam 310-12 and TRADOC Pam 71-9. Type, quantity, locations, unit cost, condition, system classification, and mobilization requirements are identified on ADAM to include an audio-visual equipment inventory. The ADAM System provides on-line interactive data entry, edit, and update capabilities and is run on the Unisys A10 computer located at Ft. Eustis. There are presently 17 TRADOC and 13 FORSCOM TSCs with interactive terminals which provide the TSCs with the capability to update the inventories from their locations. ADAM was initially fielded in the FY 77-79 timeframe. ADAM, SQTIII, and RMIS automated systems are planned for plans to integration into the other TRAMOD systems.

TRADOC Education System Non-Resident Instruction (TREDS-NRI). The TREDS-NRI is a system for the administration of the Army service school's consolidated Correspondence Course Program (ACCP). It encompasses the correspondence course program of 34 TRADOC, DA, and DoD schools and agencies and provides paper-based self-study courses to 413,000 soldiers and DA civilians world-wide. TREDS-NRI enrolls and maintains student personal and academic status, curriculums, inventory, inventory and sub-course components, school's catalogues, and grading key master data. It is operational on the UNISYS 10 mainframe at Ft. Eustis and was fielded in FY 72. Current plans are to connect the TREDS-NRI to the other TRAMOD systems.

ARMY Range and Targets Management Information System (ARTMIS). This system is currently at the conceptual stage and will be designed to support the MACOM range and target facilities managers. It will provide to them a summary of their installation's training facilities, to include ranges. It will also serve as a filter for data to be passed to the HQ DA system. The system will be driven by the information available in the Range and Facility Management Support System (RFMSS) and Automated Range Safety and Management System (ARSAMS), and will communicate with the DoD Installation Ranges and Targets (DIRT) database, at the Training and Performance Data Center (TPDC). System implementation is currently planned for FY 92. This system will become part of the overall TRAMOD system.

Army Lessons Learned Management Information System (ALLMIS). The ALLMIS is a textual listing of subjective recommendations to update doctrinal, training, materiel, organizational, and leadership (DTMOL) issues based on observations by subject matter experts (SME). The SME defines a deficiency in the doctrine based on observations of field training exercises, including joint, combined, and CTC exercises, and combat experience. The comments are then reviewed by the Center for Army Lessons Learned (CALL), and if appropriate, included in the database. Currently, ALLMIS supports trainers through dial-in capability. ALLMIS will report joint operations, combined operations, combat experience, and CTC evaluation and feedback information to ASAT and the Reserve Component Automated system (RCAS). ALLMIS was initially fielded in FY 89. It is currently a PC driven RDBMS application program requiring dial-in capabilities to the Ft. Leavenworth installation TISI mainframe. The installation TISI stores applicable feedback data to be downloaded to the user's PC to be manipulated using the REBMS programs.

Combat Training Center Evaluation and Feedback System (CTC ARCHIVE). This system supports trainers through limited dial-in capability. In the future, the CTC-Archive will report CTC evaluation and feedback information to the ASAT, Standard Army Training System (SATS), and RCAS. CTC data are routinely collected and forwarded to ARI-POM where they are archived. The archive presents Armor and Mechanized Infantry Task Force rotations at the National Training Center (NTC) beginning with the first rotation in 1981 to the present. The NTC database contains the event driven

data captured during the engagement training exercise. Primary data elements are fire event (trigger pulls), pairing events (matched/unmatched), common events (key depressed/released), position/location with events (every five minutes), control measures (type and location), and unit organization. The Joint Readiness Training Center database includes textual observations and digital tables of Training and Evaluation Outline data. It provides an automated system to report CTC evaluation and feedback information.

TRAMOD will eventually be an excellent source of data from the TRADOC community for all training information. Most of the systems discussed above are not currently integrated. This current status would require downloading information from each system for TRASER. The TDWMS and ASAT are crucial automated systems for feeding TRASER because the training information to be contained in them currently exists only in a paper-based form.

In summary, the data to support the TRASER model are available in the TRADOC community and will be accessible when TRAMOD is activated and functional. The current estimate for TRAMOD operational capacity is FY 92.

Belief In Data Used To Support TRASER Decision Recommendations

One of the research issues for the TRASER project was to investigate some of the ramifications associated with the aging of information and data. While simple chronological age is addressed in the IDEFo analysis, age is not sufficient to measure the usefulness or the quality of information. When changes in the new weapon system design or the operational environment trigger the use of TRASER, there should also be an adjustment of the uncertainty associated with the information used to drive TRASER. Of the four systems for handling uncertainty in decision support systems, Bayesian belief networks, certainty factors, Dempster-Shafer evidential reasoning, and fuzzy set theory, the TRASER team believes that there are significant shortcomings associated with all but the Dempster-Shafer evidential reasoning system. Bayesian belief networks require that all probabilities associated with the uncertainty of training information be known a priori, an impossibility with any time dependent belief variables (Goodman and Nguyen, 1985). Certainty factors, pioneered by Buchanan and Shortliffe in the MYCIN expert diagnostic system (Rich, 1983) uses a manual adjustment scheme and simply lack the mathematical rigor to be cost effective for the large data sets associated with TRASER. Fuzzy set theory lacks the exactness necessary to support costly training system decisions (Hollnagel, 1989). In contrast, Dempster-Shafer evidential reasoning is calculated with multiple

measures of belief rather than a single variable probability associated with each data value. This allows a predictable, deterministic measure to be computed based on a number of variables, such as chronological time, belief of certainty in the original value, and any casual changes, such as change of weapon system design or training development policy. Our analysis shows that information uncertainty management can be feasible in a system such as TRASER and can effectively address the issue of having belief and confidence in the data used to support training decisions.

Database Consideration Summary

The TRASER analysts have been matching data requirements as brought out in the IDEFo analysis to data availability in order to minimize costly data collection efforts. Additionally, it has been determined that there are three types of data storage requirements, knowledge bases, image bases, and relational databases, best suited to store TRASER data. Also, it has been determined that it is feasible to collect the data necessary for a comprehensive TRASER-like system by matching data formats to existing projects and leveraging other agencies' data collection efforts. A precedence for formats has been proposed to aid in forming a detailed data definition scheme, and suggested sources for specific data have been made. TRASER is feasible from a data perspective.

Appendix K

Additional Potential Intervention Points

Appendix K
Additional Potential Intervention Points

This appendix contains discussions of potential TRASER intervention points during demonstration and validation, full scale development, and production. Discussions of potential interventions during concept exploration are presented in the Results section of this report.

Intervention Points in the Demonstration and Validation Phase

Baseline Training Requirements. Because the emphasis in data shifts from historical to current data in the demonstration and validation phase, there will be less opportunity for complete automated intervention to define baseline training requirements. The SAT aids used in the concept exploration phase, however, can be useful as aids to performing functions manually in this phase. These tools aid the user in conducting "front-end analyses" by using elaborate prompting to identify MOSs, tasks, and other requirements. Such aids, either in their present form or in a revised TRASER form, will reduce the manpower required to arrive at a baseline ITS design. In addition to design aiding, TRASER can offer support in comparing notional data to baseline training requirements.

Optimization Strategy. The same chances for intervention exist at this phase as they do in the concept exploration phase. With better information about the new weapon system program (particularly constraints in funding), the optimization strategy can be sharpened in this phase.

ITS Design. The same capability for generating alternative ITS designs and relative cost-effectiveness measures exists in this phase too. Perhaps the biggest potential intervention point in the Demonstration and Validation phase is the design of simulators and other training equipment, based on better information about the new weapon system. OSBATS will integrate with TRASER and will support this function with information, such as the type, number, and design of training equipment for the optimal ITS design. TRASER will provide input data to OSBATS and OSBATS will in turn provide output to TRASER. To fulfill all functions required by the TRASER process of ITS design OSBATS will have to be modified. Should these modifications not be feasible, the design of simulators and other training equipment could be performed by analysts with support from OSBATS in areas consistent with OSBATS capabilities. The simulator and other training equipment design would, therefore, remain a manual task with selective aiding by OSBATS. If the TRASER, aided by OSBATS, process for designing simulators and other training equipment is to be largely automated, OSBATS must be modified as follows:

- Expand OSBATS' scope to encompass maintenance and support personnel training equipment.

- Expand OSBATS to encompass all training equipment media elements in the TRASER training system design element taxonomy.

- Expand OSBATS to encompass collective training and combined arms training equipment, including networked non-system training equipment.

- Incorporate current Army procedures for training equipment design and justification into OSBATS.

- Incorporate TRASER's concept of optimization and the use of an optimization strategy on training equipment design.

- Include embedded training in the OSBATS suite of candidate training equipment.

If such changes are made to OSBATS, it will meet most TRASER requirements for arriving at a design of training equipment to complete an optimal ITS design.

Evaluation. The same chances for intervening in the notional CTEA process exist in the Baseline phase (Demonstration and Validation). Until adequate cost and training effectiveness measures exist for TRASER ITS elements, little can be done to automate the process. However, some form of prompting may be possible.

Training Output. This function will still offer good chances to automate. The audit trail function will allow the User to quickly retrieve earlier generations of the ITS design, as well as to retrieve policy statements and other written material that is pertinent to the design. Concordances of data in the audit trail can be created to understand and deal with major changes to the ITS caused by weapon system ECPs. It is understood that a new weapon system undergoes thousands of ECPs during its evolution in the 12-year LCSMM process. This function can be used to capture ECPs, assess their potential impact on the ITS design, and identify changes that are required.

Summary of Baseline Interventions. In this phase, there will be fewer chances to intervene and completely automate major functions. However, automated aiding and prompting of baseline functions will enable TRASER to make the user's roles more efficient. The man-machine allocation study in the next phase of TRASER will determine just how many of the baseline functions actually can be aided or automated.

Intervention Points in the Full Scale Development Phase

TRASER routines can be used as an aid to the government personnel in conducting the various reviews of the contractor's ITS designs. The first opportunity will be in evaluating contractor proposals. In submitting proposals, the various competing firms propose the ways they plan to respond to training requirements. Proposals will differ, both in the details of the technical approach, and in cost. The proposals may differ from the government's carefully derived ITS design. The detailed TRASER ITS design, listing all the elements called for to meet requirements, can serve as a checklist in proposal evaluation, and TRASER routines can be used to consider the merits of variations from the governments baseline ITS design.

The TRASER generated ITS design will include not only the elements to be developed by the contractor, but will also include those elements to be put in place by various government agencies. This may include range development, the design, development and production of training unique ammunition or non-system training devices for combined arms training, distributed training materials, evaluation programs, facility improvements, new MOSs and a variety of other supporting components or actions. The version of the ITS design maintained within TRASER during full scale development contains all these elements and is called the Actual ITS Design. It contains detailed descriptions of both contractor and government development items and it is updated as changes are made during the actual development of these various items. This design will be used by the TSM and others in coordinating and synchronizing the development of the components of the ITS to be developed by the government with those being developed by the contractor.

Intervention points in the Production and Deployment Phase

TRASER contains the Army-wide view of the ITS. The ITS designs being maintained within TRASER include training for the various MOSs that work on or with the weapon system, including resident service schools, unit training, and distributed training, both of the active component and the reserves. When training deficiencies occur, they can be resolved in various ways. The broad view of the ITS contained in TRASER will suggest alternative solutions that may not be apparent to those training developers with a view of only one component of the system.

During this phase of the life-cycle of the ITS two versions of the TRASER ITS design are maintained. This is required because the ITS is in a constant state of change. Therefore, the first of these new records to be maintained is the Currently Implemented ITS Design which documents the ITS as it is currently configured. This view of the ITS will have various uses in

support of ITS management, evaluation, and update. In addition, a second version of the ITS design is maintained. It is the Future ITS Design which records the many changes that are being developed but have yet to be introduced into the system. In proposing a patch to one component of the system, (e.g., the development of distributed training materials for system maintenance), the ITS designer can review all the other changes being made including the expected date that the change will be introduced. These Army-wide and time phased views of the ITS will make it easier for the many components of weapon system training to be viewed as a system, and to be used and managed as a system.

Appendix L

Potential Users of TRASER

Appendix L
Potential Users of TRASER

Organizations in the LCSMM process were identified that are involved in the acquisition of new weapon systems and their ITS. This led to a focus on the Training and Doctrine Command (TRADOC) and the Army Materiel Command (AMC). Within these organizations the focus was on the roles of training developers who interact with both materiel developers and combat developers.

Users Within TRADOC

The personnel in TRADOC represent the interests of the user. For the Concept Based Requirements System (CBRS) process, the Directorate of Combat Development (DCD) at the proponent school sets the requirements through its Requirements Branch. Another part of DCD conducts studies and analyses as part of the CBRS in order to determine what will meet Mission Area Analysis (MAA) or Battlefield Development Plan (BDP) requirements.

DCD acts as the trigger to initiate materiel acquisitions. DCD does not participate in the design or development of training systems in major materiel acquisitions, except to set the requirement for a materiel solution for an MAA or BDP deficiency.

The organization that does get involved in training for TRADOC early in the weapon system process is the Directorate of Training and Doctrine (DOTD) which has four divisions, two of which are relevant to major new materiel acquisition programs. The examples given here are from the aviation proponency. They are:

- Individual and Unit Training Division (IUTD) - responsible for the development of requirements for training other than training devices. Within IUTD are the various training departments that develop such Materials as the Plan of Instruction, lesson plans, and other courseware.

- New Systems Training and Simulator Acquisition Division (NSTSAD) - responsible for the analysis and establishment of requirements for training devices and simulators. Under NSTSAD there are three branches that perform various functions related to training device requirements and design. They are:

  - New Equipment Training Development (NETD) Branch - responsible for preliminary analyses for new weapon systems coming on-line in Army aviation. This branch develops input to every DCD requirements document,

such as the O & O Plan, Justification for Major System New Start (JMSNS), and the System Training Plan (STRAP). This branch also creates training requirements in the form of task listings for the new weapon system.

- Aviation Simulation Materiel Development Branch - responsible for requirements for life cycle training device management. This branch provides an alternative to contracting for design of notional training device suites and simulators.

- Aviation Simulator Training Research Branch - responsible for conducting studies and analyses on various media, including training device configurations. This branch develops training media alternatives and conducts trade-off studies as part of the Cost and Training Effectiveness Analysis (CTEA) which is, in turn, part of the Cost and Operational Effectiveness Analysis (COEA) performed on the weapon system. Analysis in this branch conforms grossly to the SAT process.

The various divisions and branches of DOTD are responsible for establishing training requirements and creating notional training system concepts very early in weapon system development. Such development may begin before Milestone 0 and will continue through Milestone II. In this regard, DOTD can be considered the prime candidate user for TRASER. The areas of DOTD responsibility that are potentially facilitated by TRASER are:

- Collecting, assembling, and facilitating analyses of historical task data and other forms of training requirements.

- Formulating notional ITSs, including alternatives.

- Conducting trade-off studies and cost-effectiveness studies on alternative notional ITSs.

- Generating data for LCSMM output.

The DOTD personnel at the Army Aviation Center indicated that a tool like TRASER would be valuable if it creates valid outputs, is easy to use, and does not require much time to support (i.e., keep databases loaded with current data). These three characteristics may be considered important design guidelines as the TRASER concept matures.

<u>Program Managers</u>

When a materiel acquisition is identified by the CBRS process and the funding estimate of the materiel acquisition

reaches predetermined thresholds, the materiel acquisition is identified as a major materiel acquisition program. A new materiel acquisition program is launched to meet the specific deficiencies identified in the MAA or BDP. When the solution has been identified as a materiel deficiency and certain criteria are met, the job of designing a new weapon system to offset that deficiency is assigned to a Program Executive Officer and a Program Manager (PM). At this point, either the standard LCSMM process or the accelerated process (ASAP) is selected. The ASAP process is used when the solution is urgently needed to meet existing threat conditions.

The PM has overall responsibility to the user (TRADOC) to procure a materiel solution that addresses the need stated in the BDP. Part of the major new weapon system that is evolved to meet the BDP is the ITS. To ensure that training requirements are also met by the new procurement process, the PM historically has selected from two alternatives:

- Designate a Training Manager within the PM office, as was done on the LHX program; or
- Obtain functional training support from the NET group at AVSCOM, as was done on the AH-64 and other programs.

In either case, the duties of the Training Manager are reported to be the same. In one case, the Training Manager is located directly in the PM office which elevates the role of training in the overall weapon system development process. In the other case (NET group), the training function is located in the Directorate for Maintenance. Both of these organizational entities are candidate users for the TRASER system. Both organizations have the same responsibility: produce a viable ITS that is ready for training IOC.

If one takes the LHX project as a model, training development began shortly after the AMAA and BDP were published in 1982-1983. LHX personnel in the PM office began an enlightened program to elevate the status of training, involve the user, and start earlier to produce a quality ITS. Early input from training was made to the O & O Plan and the MENS. Such early response, coordinated with the user NET groups, is made at the request of another user organization, Directorate for Combat Development (DCD), which has the responsibility for output of the O & O Plan and other requirements documents.

After program initiation (Milestone 0), the PM/Training launched an effort to create a notional training system during the Concept Exploration phase of the LCSMM, from which requirements for the actual training system could be derived. With cooperation from the users at the Army Aviation Center and the Army Aviation Logistics School, requirements for a notional training system were derived from historical descriptions of

previous ITSs, primarily from the AH-1 and AH-64 helicopters. These data, in the form of task listings, were used by the Studies Branch of DOTD at the Army Aviation Center to generate alternative training media which were traded off in concept formulation to arrive at the Best Technical Approach (BTA). A contract was also let during the Concept Exploration phase to describe and provide cost estimates for a suite of training equipment for both operator and maintainer training. Together, these data were used to create the early description of a notional ITS for the LHX program.

During this process, PM/Training served as Training Manager by coordinating with other organizations, working to obtain funding for the training concept, developing a procurement strategy for training, and generally facilitating the development of the notional ITS. The notional ITS proved to be very useful in defending the training budget, obtaining visibility within the weapon system development process, and generally elevating training to a level where it is a significant element in the materiel acquisition process.

According to those interviewed at AVSCOM, had the PM/Training not been able to get the user to define the notional ITS, that job would have been performed in the PM office or assigned to the NET group at AVSCOM. Another possibility would have been to contract for design of the notional training system much as the training device study was contracted.

The PM/Training (either in the PM office or in the NET group at AVSCOM) is a potential user of TRASER. Personnel interviewed about this possibility indicated that any tool provided them must be user friendly, require little day-to-day support from the user, and must make their job easier. As noted previously, these characteristics may be guidelines for TRASER as it matures.

<u>Program Manager for Training Devices</u>. Early in the weapon system development process, the PM (e.g., LHX PM) must decide what procedures will be used to procure training devices and who will manage and support training devices for the new weapon system. There are basically three options:

- Write a Memorandum of Understanding with PM TRADE, in which PM TRADE is to take on the entire training device development and support effort for the life cycle of the weapon system. Historically, this has been the path selected by aviation program managers;

- Opt for a "turn-key" solution by having the weapon system contractor write the specification, develop the devices, operate them, and support them for the life cycle. This is the direction that the LHX PM is taking at this time; or,

- Opt for a "partial turn-key" approach in which the contractor specifies the training device designs and builds them, but PM TRADE supports them for the life cycle. This is also an option for LHX.

If the first option is exercised, PM TRADE performs the AMC role in concept formulation, design, development, production, and transition of training devices to a Major Subordinate Command (MSC) for life cycle support. If the devices are not supported by an MSC, PM TRADE assumes responsibility for the life cycle support of the device or devices.

By charter, PM TRADE's focus is on training devices within an ITS context. In practice PM TRADE procures training devices but only indirectly participates in the broad concept formulation studies that determine the characteristics of Army-wide training programs. However, PM TRADE personnel have expressed a goal of participating more fully in the broad ITS design efforts. Because of the importance of simulation and embedded training in the trade-off studies, expert information on simulation in its various forms, and on the feasibility of using simulation for a range of purposes, is needed during the concept formulation phase of ITS design. PM TRADE has this expertise, and should be a participant in this phase of training design. TRASER could be used by PM TRADE in partnership with AMC and TRADOC in carrying out this envisioned role.

Appendix M

Weapon System Design in Early LHX O&O Plan

Appendix M
Weapon System Design in Early LHX O&O Plan

V. (U) OPERATIONAL PLAN.

A. (U) Current doctrine and the emerging concepts require Army aviation participation in all battlefield tasks and mission areas. The introduction of the LHX will enhance Army aviation's role in performing combat, combat support (CS), and combat service support (CSS) operations.

B. (U) The LHX must consist of a family of light, fast, highly maneuverable aerial vehicles that will capitalize on commonality and must be capable of conducting nap-of-the-earth (NOE) operations continuously throughout the entire battlefield against a sophisticated threat who has the capability to use nuclear, biological, and chemical (NBC) and DEW. By capitalizing on NOE operations, its design, or both, the LHX must:

-- Avoid detection by the threat when operating approximately 2-3 km from the following kinds of detectors:

1. Aural.

2. Optical.

3. Thermal imaging systems.

4. Air defense artillery radar.

-- Avoid being engaged by thermal seeking missiles while operating approximately 2-3 km from the missiles.

The LHX must have an integrated and automated cockpit; worldwide navigation capability; and secure, electromagnetic pulse (EMP) and electromagnetic interference secure, electromagnetic (EMI) hardened avionics. The LHX must be self-deployable to Europe and be rapidly transportable by interheater tactical air transport. The capabilities of the LHX must expand Army aviation's ability to perform its missions continuously in adverse weather and over all terrain. These capabilities include air-to-air (ATA) combat, deep attack, continuous day and night operations on an integrated battlefield, more rapid tailoring of units to meet the demands of the fluid battlefield, and increased ability to remain in the battle. The LHX must be fielded in units that have combat, CS, and CSS missions.

C. (U) The LHX-Scout/Attack (SCAT) must be capable of rapidly varying configurations from pure scout up through fully armed attack with the use of a minimum number of mission kits and must incorporate automatic multiple target acquisition,

prioritization, and handover capabilities. The ASLT must provide internal and external cargo transport, tactical team transport, command and control (C2), and liaison transport and must incorporate an ATA combat capability.

D. (U) The commander of each attack helicopter company requires a two-seat SCAT to facilitate C2. One back-up two-seater is required in each company and troop. Each attack helicopter battalion and air reconnaissance squadron commander also requires one for C2. The aircraft would also provide for unit training.

E. (U) The LHX Operational Mode Summary and Mission Profiles (OMS/MP) are included in this annex.

1. (U) C2. LHX must support the C2 effort by greatly enhancing the

3. (U) Air Defense. The destruction of enemy aircraft with ATA weapons is the LHX's primary contribution to the total force air defense effort. Additional capabilities include detection and engagement of enemy air movements and rapid repositioning of lightweight or man-portable air defense assets.

4. (U) Communications. The LHX provides for the uninterrupted operation of all onboard communications equipment. The LHX can provide airborne retransmission of voice and data communications in a secure mode. Additionally, the ASLT can rapidly transport communication support systems, emplace automated communications in remote areas, and provide secure courier service for sensitive information.

5. (U) Intelligence Electronic Warfare (IEW). The LHX supplements the commander's other IEW systems. It aids in the detection, location, and identification of enemy units by using onboard sensor packages or positioning both attended and unattended ground sensor systems.

6. (U) CSS. The flexibility and mobility of the ASLT provide an additional capability to rapidly transport and recover small numbers of personnel and light material anywhere on the battlefield. The medical evacuation of patients and the movement of small teams and their associated equipment must also be included. The EDEVAC ASLT will operate primarily in the division area, on single aircraft, immediate response type missions, with no weapons systems onboard.

VI. (U) ORGANIZATION PLAN.

A. (U) The organizational designs of LHX-equipped units will be finalized when the SCAT and ASLT system designs are finalized, peculiar support requirements are identified, and

capabilities are demonstrated. Organizations described in Field Circular 100-1, The Army of Excellence, September 1984, provide the point of departure for designing LHX organizations. Support for these units will remain the same as with the current fleet except for aviation maintenance. With the LHX, aviation maintenance support requirements will be reduced and simplified with only two levels: aviation unit maintenance (AVUM) and depot maintenance.

1. (U) The SCAT will replace the AH-1 and OH-58A&C helicopters in aviation reconnaissance and attack helicopter units. As a bases for planning, aviation reconnaissance troops and attach helicopter companies must have 8 SCAT aircraft.

Appendix N

Training Section of Early O&O Plan

Appendix N
Training Section at Early O&O Plan
ANNEX F - LHX TRAINING SYSTEM

1. TITLE: THE LHX TRAINING SYSTEM

2. ORGANIZATIONAL/OPERATIONAL CONCEPT:

A. INSTITUTIONAL TRAINING REQUIREMENTS: The institutional training base requires a training system to provide LHX aircrew, maintainer, and supporting MOS qualifications and/or requalification. The system will use a building block approach to training, to provide classroom instruction in various aircraft subsystem functions, normal and emergency operating procedures, maintenance procedures, aircraft operation and mission employment. Hands-on training, including part task trainers, simulators and actu aircraft, will reinforce classroom instruction. The institutional training bases are: 1) Aircrew: Ft. Rucker, AL; 2) Maintainer: CMF 67/68, Ft. Eustis, VA; CMF 28, Ft. Gordon, GA; and 3) Military Intelligence: sensor operators - Ft. Huachuca, AZ; ASE maintainers - Ft. Devans, MA.

Respective institutional training systems must be developed based on institution-peculiar requirements for peacetime and mobilization scenarios and student loads, and must minimize additional facility requirements.

B. NON-INSTITUTIONAL TRAINING REQUIREMENTS: A training system to support mission, continuation, skill level advancement and/or sustainment training for qualified LHX personnel worldwide is required at accessible locations. High cost, high fidelity/complexity devices will have a lower density than lower cost, lower fidelity devices. Low cost devices will be used at the troop or squadron level. Unit personnel will operate them and conduct routine preventive maintenance. Complex devices (e.g., combat mission simulators) will be located based upon cost and training effectiveness considerations, including projected personnel densities, military construction and operating costs. Field training device strategies must consider training time available, individual, unit and combined arms training requirements.

C. NON-LHX SPECIFIC SUPPORT PERSONNEL TRAINING REQUIREMENTS:

LHX peculiar training to qualify and/or requalify support personnel (e.g., flight operations specialists (93P), petroleum and ammunition handled is required. Required LHX related media to enable continuation, advancement familiarization, and on-the-job training for support personnel may cause new developments or existing programs, courseware or devices to be modified.

3. ESSENTIAL CHARACTERISTICS:

A. Procedural Training. Training for items (1) through (9) will be in addition to the use of the aircraft or actual equipment (MAV). The LHX training system will be provided appropriate devices and/or simulators for:

(1) cockpit procedure training at the institution (MAV).

(2) weapons procedure training (MAV).

(3) sensor procedure training (MAV).

(4) aircraft survivability equipment training (ASE) (MAV).

(5) aircraft emergency procedure training (MAV).

(6) aircraft operating procedure training under adverse weather and degraded capability conditions (MAV).

(7) training in LHX systems, subsystem and support equipment troubleshooting procedures (MAV). Subsystems include electro-optics, ASE, weapons, avionics, flight controls, powertrain and others.

(8) component removal, replacement and repair procedure training (

(9) procedural training in LHX data entry/retrieval (MAV).

(10) training in LHX flight and mission planning procedures (BOC).

B. Hands-on training in the LHX training system will be provided using:

(1) bench maintenance components (MAV).

(2) two-seat training aircraft at the institution (MAV).

(3) two-seat unit training aircraft available for refresher training, standardization evaluations, post-incident evaluations, and other eval

(4) category B aircraft and/or composite system trainers for CMF 67 and CMF 28 training at the instituition (MAV).

(5) dummy ordnance for aircrew training at high gross weights and ammunition handling training for support personnel (MAV).

C. Task synthesis/loading

(1) Combat mission simulations are required at the institution and in the field to train aircrews in concurrent aircraft system operation and mission equipment package employment (MEP)(including air-to-air and air-to-weapons, sensors and ASE) in a realistic combat environment (including NBC degraded operations, day/night, weather obscurants and an interactive three (MAV). Capability for shipboard operations is desired (BOC).

(2) Composite system training is required at the institutions to teach maintenance, troubleshooting and repair interactions of aircraft systems and MEP (MAV).

(3) Modular architecture is desired for sophisticated devices to enable unneeded subsystems in a particular training phase to be inactivated or not installed (BOC).

(4) Commonality of visual systems, motion base and environment are desired between LHX CMS variants (SCAT and Utility) (BOC).

(5) Reconfigurable device software or peripherals are desired (BOC).

(6) Capabilities to provide realistic collective training as part of the aviation combat team and the combined arms team are required (MAV).

(7) An LHX model for the ACATT is required (MAV).

(8) Enhanced in-flight training capabilities for MEP use and collective training (including combined arms) are desired (BOC).

D. Embedded Training (The following will not adversely effect LHX combat readiness for shorten component life (MAV).

(1) A built-in LHX MILES-AGES/AD capability is required (MAV).

(2) On-board air-to-air combat training features are required (MAV).

(3) Built-in air-ground engagement training features are required.

(4) On-board ASE/EW training features are required (MAV).

(5) Scenario practice using on-board systems, while airborne and on the ground, is desired (BOC).

(6) Procedural training using on-board systems, while on the ground is desired (BOC).

(7) Navigational Training using on-board systems, either airborne or on the ground, is desired (BOC).

(8) Embedded performance feedback capabilities are desired (BOC).

E. Courseware:

(1) LHX Courseware development will be IAW applicable TRADOC regulations (MAV). Programs of instruction (POIs) will include qualification transition, refresher and instructor courses for applicable MOSs.

(2) Courseware, including POIs, will be automated, documented and oriented at the appropriate intelligence/education level (MAV).

(3) LHX training times will not exceed those of systems that it will replace, considering new equipment or missions (MAV).
Lesser training requirements are desired (BOC).

(4) Sustainment and continuation training for all LHX MOSs must be considered during course development. The proponent will be provided information for appropriate training publications (e.g., ARTEPS, ATMs) (MAV).

(5) Procedures will be established for quarterly Army review and approval of contractor developed curricula (MAV). Continual user involvement is desired (BOC).

(6) TRADOC will inform AMC of the target user population and help identify unusual inherent training requirements. The reading grade level (RGL) of required publications will not exceed plus 1.0 of the RGL provided in the target audience description.

F. Software:

(1) The LHX training system computer language will be Ada (MAV).

(2) Software interchangeability, within the LHX training system is required (MAV) and between it and other training systems (e.g., EIDS), is desired (BOC).

(3) Software dependant devices will have a student performance feedback capability (MAV). A student progress record is desired (BOC).

(4) Self-teaching features in software dependant devices are required (MAV). Variable difficulty and freeplay capabilities are desired.

(5) Device tests and operation will not pose a TEMPEST hazard (MAV). "TEMPEST-proof" devices are desired (BOC).

G. Configuration:

(1) Device configurations in the LHX training system shall replicate the appropriate aircraft/equipment or environment, to the extent necessary to accomplish effective training (MAV).

(2) Devices which produce negative training effectiveness ratios are not acceptable (MAV).

(3) Reconfigurable devices that enable training on either LHX variant are desired (BOC).

(4) Standard instructor/operator (I/O) stations between similar devices are desired (BOC).

(5) Reduced use of GFE through simulation and/or dummy equipment is desired (BOC).

(6) Growth potential and PSI must be addressed in training equipment design (MAV).

H. Commonality:

(1) Linkage of multiple units of a device or connecting different devices for a collective training role is desired (BOC).

(2) Hardware component commonality/compatibility (e.g., CRTs, disk players), within the LHX training system and other systems, is desired (BOC).

I. Size:

(1) Low complexity, unit level and institutional devices will be designed to enable movement through standard exterior/interior doors by one or two personnel without disassembly below authorized levels (MAV).

(2) Unit level devices will conform to available training space (MAV).

(3) Economically relocatable simulators and devices are desired (BOC).

J. Power constraints: LHX training device power consumption will conserve energy and will be compatible with its operational location. Appropriate electrical surge protection is required (MAV).

K. Environmental/Safety:

(1) Low complexity training devices will have adequate temperature (10-35 C) and humidity (10-95%) tolerance for its intended environment (MAV) not exceed those of current, similar devices (e.g., AH-64 CMS) (MAV).

(2) Device environmental requirements will be identified and will not exceed those of current, similar devices (e.g., AH-64 CMS) (MAV).
Reduced environmental control requirements are desired (BOC).

(3) All elements of the LHX training system will, at a minimum, meet all applicable OSHA and Army standards for safe equipment usage (MAV).

(4) Noise levels will not exceed 10 decibels above ambient at any point two meters away from the device (exception: training aircraft)(MAV).

(5) A training-save capability (reduced eye hazard, but ranging capable) for LHX tactical emitters (e.g., laser) is required (MAV).

L. RAM Parameters:

(1) Appropriate RAM requirements parameters are currently unavailable since key variables are undefined. However, RAM will be determined based upon the contractors' proposed aircraft system and training system. Separate, tailored RAM parameters are envisioned for each proposal. This will occur during the SSEB and be translated into the contract awards.

(2) Device RAM objectives will at least meet current industry achievements which are ....

4. TECHNICAL ASSESSMENT (TBP by AMC)

MODERATE technical risk based upon demonstrated or reasonably attainable concepts.

5. LOGISTIC SUPPORT

A. Life-cycle contractor support of training devices is envisioned for other than routine operator maintenance.

B. Software support will be contractor provided, with oversight by US Army World Wide Software Support Office.

C. Required technical data packages and manuals for the LHX training system will be procured with the system. Packages will include repair parts lists, calibration and adjustment procedures, finalized schematics, and software documentation. Preliminary technical data packages and manuals will be provided to the proponent schools and will be adequate to allow competition of maintenance contracts.

D. Special tools and support equipment will be minimized, but procured (along with appropriate initial spares) with supported devices.

E. AMC, with the contractor, will ensure that all LHX system MWOs, ECPs, P3I and PIPs are applied to the LHX and its training system concurrently.

6. TRAINING ASSESSMENT:

A. The LHX training package will be used for IKPT and will be available for DT/OT player training.

B. The contractor will provide initial I/O training, POIs for each device, and course updates for device modifications. Courses will be IAW TRADOC regulations.

C. Unit level devices will be "user friendly".

D. TRADOC will provide AMC information about the target user (I/O) population and help identify any unusual inherent training requirements. The RGL of required publications will not exceed plus 1.0 of the I/O RGL.

E. The training system above will help resolve deficiencies 20, 80, 95, 112, 142, 167 and 174 of Battlefield Development Plan-84.

7. MANPOWER ASSESSMENT:

A. New device related MOSs are not envisioned. I/Os will be qualified are retain that instructor ASI associated with their LHX MOS.

B. Army I/O personnel will not be required for training devices beyond those personnel positions identified in unit TOE/TDA.

C. Complex training devices assigned on the TDA of an installation will have personnel identified for its operation and administration. Assets will be provided by the MACOM the facility supports. Personnel requirements will not exceed those of the AH-64 CMS, or comparable device, on a per device basis. Total numbers may exceed the AH-64 requirements due to an increased fleet size, yet to be established.

8. FUNDING

(TBP by AMC)

Appendix O

List of Acronyms

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Acronym	Definition
AAMAA	Army Aviation Mission Area Analysis
ACCP	Army Correspondence Course Program
ADAM	Army-wide Devices Automated Management System
AETIS	Army Extension Training Information System
AIMS	Automated Instructional Management System
AIRNET	Aircraft Simulation Network
ALLMIS	Army Lessons Learned Management Information System
AMC	Army Material Command
AMM	Army Modernization Memorandum
ARI	Army Research Institute for the Behavioral and Social Sciences
ARSAMS	Automated Range Safety and Management Systems
ARTEP	Army Test and Evaluation Program
ARTMIS	Army Range and Targets Management Information System
ASAP	Accelerated System Acquisition Process
ASARC	Army Acquisition Review Council
ASAT	Automated Systems Approach to Training
ATRRS	Army Training Resource Requirement System
ATSC	Army Training Support Center
AVSCOM	Aviation Systems Command
BDP	Battlefield Development Plan
BFMA	Battlefield Functional Mission Area
BoB	Blueprint of the Battlefield
BOS	Battlefield Operating System
BTA	Best Technical Approach
CALL	Center for Army Lessons Learned
CALS	Computer-Aided Logistics System
CASDAT	Computer-aided System for Developing Aircrew Training
CBRS	Concept-Based Requirements System
CD	Combat Developer
CFP	Concept Formulation Package
COEA	Cost and Organizational Effectiveness Analysis
COTR	Contracting Officers Technical Representative
CTC	Combat Training Center
CTC ARCHIVE	Combat Training Center Evaluation and Feedback System
CTEA	Cost and Training Effectiveness Analysis
DCD	Directorate of Combat Developments
DCST	Deputy Chief of Staff, Training
DIRT	DoD Installation Ranges and Targets Database
DoD	Department of Defense
DOTD	Directorate of Training Development

DSARC	Defense Acquisition Review Council
DTMOL	Doctrine, Training, Organizational, and Leadership
E-Tech	Eagle Technology, Inc.
E-TRAN	Eagle Technology Training Analysis (Database Tool)
ECA	Early Comparability Analysis
ECP	Engineering Change Proposal
ET	Embedded Training
FOG-M	Fiber Optic Guided Missile
FORSCOM	US Army Forces Command
FSD	Full Scale Development
FUE	First Unit Equipped
HARDMAN	Hardware vs. Manpower
HQ DA	Headquarters, Department of the Army
IDEFo	Information Definition, Mod O
ILS	Integrated Logistics System
IOC	Initial Operational Capability
IQC	Indefinite Quantity Contract
ISD	Instructional Systems Development
ITEP	Individual Training Evaluation Program
ITP	Individual Training Plan
ITROT	Intelligent Training Resource Optimization Technique
ITS	Integrated Training System
IUTD	Individual and Unit Training Division
JMSNS	Justification for Major System New Start
LCSMM	Life Cycle Systems Management Model
LHX	Light Helicopter Experimental
LSAR	Logistical Support Analysis Record
MAA	Mission Area Analysis
MANPRINT	Manpower and Personnel Integration
MD	Materiel Developer
MEP	Mission Equipment Package
MILCON	Military Construction
MNS	Mission Needs Statement
MOS	Military Occupational Specialty
MSC	Major Subordinate Command
MSWS	Most Similar Weapons System
NET	New Equipment Training
NETD	New Equipment Training Directorate
NETP	New Equipment Training Plan
NSTSAD	New Systems Training and Simulator Acquisition Division
NTSC	Naval Training Systems Center
NWS	New Weapon System

O&O	Operational and Organizational
OSBATS	Optimization of Simulation Based Training Systems
PARR	Program Analysis of Resource Requirements
PIP	Product Improvement Program or Proposal
PM	Program Manager
PM TRADE	Project Manager for Training Devices
PM/T	Project Manager, Training
PMO	Program Management Office
PPBES	Planning, Programming, Budgeting, and Execution System
PPIP	Pre-planned Project Improvement Plan
QQPRI	Quantitative and Qualitative Personnel Requirements Inventory
R&D	Research and Development
RAM	Reliability, Availability, and Maintainability
RCAS	Reserve Component Automated System
RDBMS	Relational Database Management System
RFMSS	Ranges and Facilities Management Support System
RMIS	Resource Management Information System
ROC	Required Operational Capability
SATA	Systems Approach to Training Analysis
SATS	Standard Army Training System
SIMNET	Simulation Network
SME	Subject Matter Expert
SMMP	System MANPRINT Management Plan
SQTIII	Skill Qualification Test Database Version 3
SS	System Specification
SSI	Soldier-System Interface
STP	Soldier Training Publications
STRAP	System Training Plan
T-CON	HARDMAN III Training Constraints Module
TD	Training Developer
TDSS	TRADOC Decision Support System
TDWMS	Training Development Workload Management System
TOA	Trade-off Analysis
TOD	Trade-off Determination
TPDC	Training and Performance Data Center
TRADOC	Training and Doctrine Command
TRADSS	Training Resource Analysis Support System
TRAMOD	Training Management Information System Architecture Modernization
TRASER	Training System Estimation and Refinement Program
TREDS-NRI	TRADOC Education System Non-resident Instruction
TRM	TRADOC Review of Manpower
TSC	Training Support Center
VTOC	Visual Table of Contents